

AD-A125 273

SHARED SAVINGS CONTRACTING FOR REDUCING ENERGY COSTS OF 1/1

DEFENSE FACILITIES(U) LOGISTICS MANAGEMENT INST

WASHINGTON DC G H GREIDER ET AL. JAN 83 LMI-AL287

UNCLASSIFIED

NDA903-81-C-0166

F/G 5/1

NL

END

FILMED
10
DTIC



NATIONAL BUREAU OF STANDARDS-1963-A

AD A1 25273

12

SHARED SAVINGS CONTRACTING
FOR REDUCING ENERGY COSTS
OF DEFENSE FACILITIES

DTIC FILE COPY

DTIC
ELECTE
S MAR 3 1983 D
B

83 02 028 072

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

**SHARED SAVINGS CONTRACTING
FOR REDUCING ENERGY COSTS
OF DEFENSE FACILITIES**

January 1983

George M. Greider
James M. Baker

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

Prepared pursuant to Department of Defense Contract No. MDA903-81-C-0166 (Task ML207). Views or conclusions contained in this document should not be interpreted as representing official opinion or policy of the Department of Defense. Except for use for Government purposes, permission to quote from or reproduce portions of this document must be obtained from the Logistics Management Institute.

LOGISTICS MANAGEMENT INSTITUTE
4701 Sangamore Road
P. O. Box 9489
Washington, D.C. 20016

**DTIC
ELECTE**
S MAR 3 1983 **D**
B

EXECUTIVE SUMMARY

The annual energy bill for Department of Defense (DoD) facilities is \$3.2 billion. Each one percent reduction in energy useage would reduce the operations and maintenance budget by \$30 million. In recent years, the private sector has developed a new approach to energy management that, if adopted by the DoD, could reduce the annual energy costs of some facilities by 20 to 30 percent. That approach is called "shared savings contracting".

With a shared savings contract, payments to an energy services contractor are made from savings realized. If there are no savings, or savings are less than forecast, the contractor receives no payment. Energy savings occur immediately, and dollar savings usually occur at the same time or shortly thereafter. Capital improvements can be financed out of the savings.

The primary risks associated with shared savings contracting relate to its being new and different. The market for energy management services is not mature and there is little government experience with this form of contracting. We recommend, therefore, that the concept be tested in several pilot projects in the DoD. This will allow DoD to explore and evaluate the concept before committing to full scale implementation. We have prepared guidelines and work schedules for a pilot project test.

Accession For	
NTIS GRA&I	<input checked="checked" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
PER FORM 50	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A	



TABLE OF CONTENTS

	<u>Page</u>
EXECUTIVE SUMMARY	ii
ACKNOWLEDGMENTS	iv
<u>Chapter</u>	
1 INTRODUCTION	1- 1
Shared Savings Contracts	1- 1
Savings Potential	1- 6
Facilities Maintenance	1- 8
2 ASSESSMENT OF SHARED SAVINGS CONTRACTING	2- 1
Types of Contracts	2- 1
Advantages of Shared Savings Contracting	2- 5
Disadvantages of Shared Savings Contracting	2-10
Factors in Implementation	2-15
Decisions and Other Hurdles	2-16
3 PILOT PROJECT: IMPLEMENTATION GUIDELINES AND WORK SCHEDULE	3- 1
Introduction	3- 1
Contracting Guidelines	3- 1
Site Selection Guidelines	3- 9
Pilot Project Work Schedule	3-11
Conclusion	3-14
4 CRITICAL CONTRACTING ISSUES	4- 1
Introduction	4- 1
Precedents and Authority for Shared Savings Contracts	4- 1
Baseline Determination and Energy Accounting Methods	4- 6
Contractor Qualifications	4-12
<u>APPENDIX</u>	
A BIBLIOGRAPHY	
B LIST OF ENERGY SERVICE SUPPLIERS	
C CONTRACT CLAUSE REQUIREMENTS	

ACKNOWLEDGMENTS

The authors would like to acknowledge the cooperation of the many DoD and Department of Energy (DOE) personnel who helped on this project, especially Mr. Millard Carr, Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs and Logistics); Lt. Cmdr. Rick Krochalis, U.S. Navy; and Mr. Barry Brown, U.S. DOE. In addition many private corporations and professionals provided useful information and advice.

1. INTRODUCTION

Throughout this report, we shall be discussing ways in which DoD can take advantage of private sector financing of equipment and service contracts to increase DoD energy efficiency. There are many forms of contracts and arrangements available which we will discuss generally as shared savings.

SHARED SAVINGS CONTRACTS

A shared savings contract is one in which the contractor is paid only out of savings realized by the client. If there are no savings, the client is protected against losses, and the contractor or his insurance company must pay the client. If the savings are less than predicted or promised, the contractor who has made the investment is at risk, not the client. The contractor's payment is thus contingent on performance, so these arrangements are sometimes called performance contracts.

When applied to the acquisition of equipment, a shared savings contract stipulates that the annual cost of leasing or financing the equipment will be less than the savings realized by its use. The client is guaranteed not to have to spend more and possibly less than current energy bills. So, the financing organization takes the risk that savings may not be sufficient to pay off lenders and investors.

Typically, when equipment is involved in a shared savings contract, title passes to the client at the end of some stated period of time. To the extent that transferring ownership was the intent of the client and contractor at the beginning, this contract arrangement would properly be called a conditional sale. The sale or transfer of title becomes final only when the client fulfills the last condition -- that is, makes the final payment. A conditional

sale contract which bases payment on a share of savings realized would be called a contingent installment purchase.¹

Obviously, a shared savings contract implies savings. Energy use in capital stock, especially in buildings, is generally very inefficient, and energy prices have increased dramatically. Both new and well-tested methods exist to reduce energy use without affecting thermal comfort. Therefore, some part of our energy budget can be saved, and the dollars saved may be significant. In fact, these types of contracts have become very popular in the private sector because the potential dollar savings are so high.

Figure 1-1 shows a theoretical energy consumption pattern over time. In this example, present energy consumption is flat. The lower line indicates the technically feasible savings' potential over the last 10 years due to new equipment and skill development.

FIGURE 1-1. ENERGY CONSUMPTION

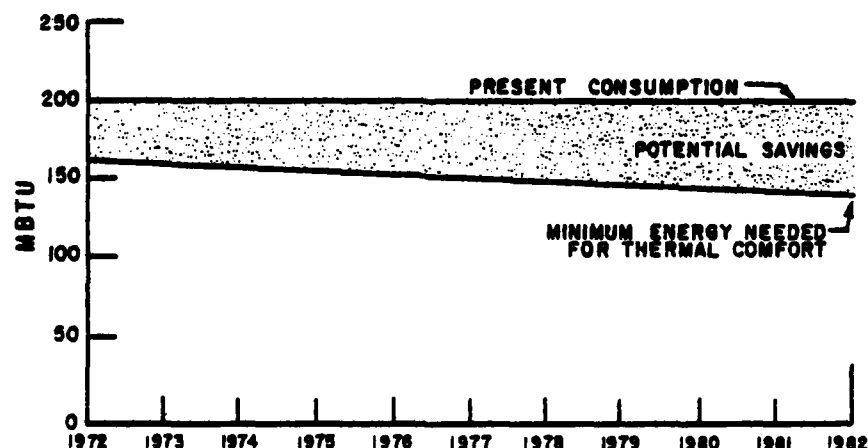


Figure 1-2 shows the increasing trend of energy prices in the same period and thus the increasing value of potential savings.² Multiplying consumption data and savings potential in MBtu's by the cost per MBtu yields energy cost, a combination of the two tables, shown in Figure 1-3.

FIGURE 1-2. ENERGY PRICE TREND

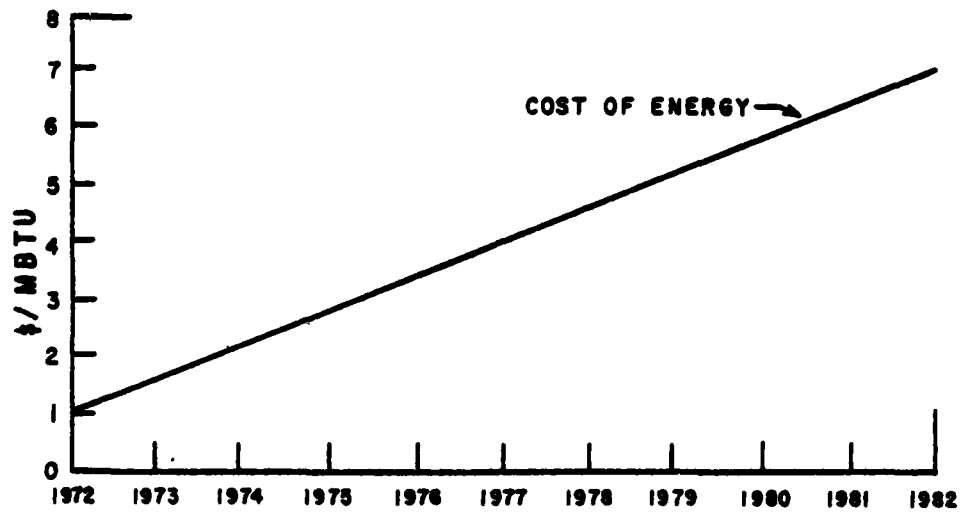
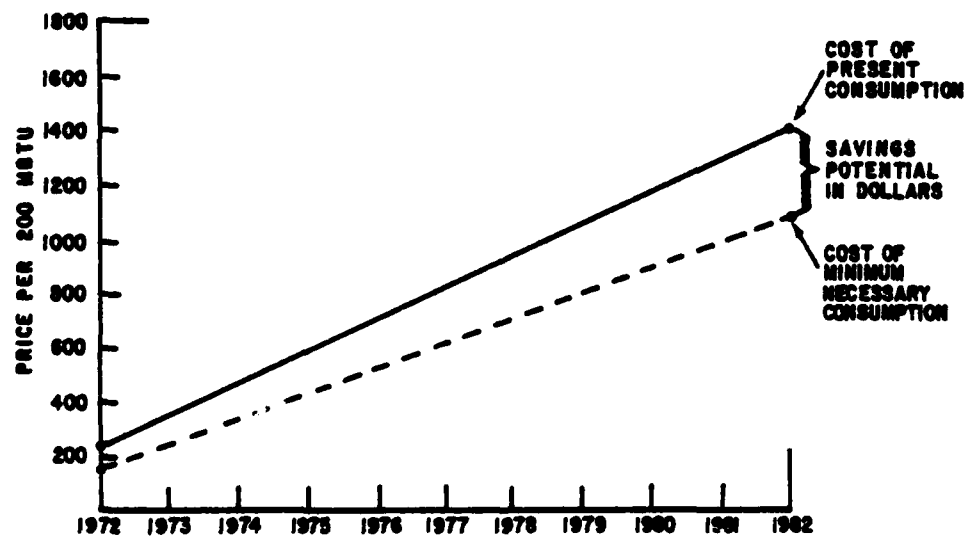


FIGURE 1-3. ENERGY SAVINGS POTENTIAL



These graphic presentations of hypothetical energy use show that the potential value of energy savings has increased greatly in the last 10 years. For most of the post World War II period, the United States has been protected by price regulation and subsidies. The major part of its building stock was designed and constructed with much lower energy costs in mind. Because U.S. prices for energy are now rising rapidly to reach parity with world prices, many businesses have become interested in capturing some of the potential savings. They are seeking to make money by saving energy.

The energy saved has a value due to its cost, but the dollar value of energy savings is an imputed or paper value since it is an avoided cost. Anyone considering an energy conservation project, especially one using a shared savings arrangement, needs to become familiar with the real value of avoided costs.

It is also important to be aware that avoiding costs does not guarantee net cost reduction. To the extent that prices rise faster than the value of energy conserved, net energy costs will rise. They will rise less steeply and to lower heights for those who conserve, but all will pay more.

The essence of the shared savings concept is that the cost of any equipment or maintenance service is less than the amount of savings realized; in other words, the cost is covered by some share of the savings. Exact arrangements will differ among contractors, but the major types are:

- Split savings
- Guaranteed energy reduction
- Fixed fee guarantee

Split Savings

The contract calls for savings realized to be documented by some method and shared by the client and contractor under a particular formula. An even split would be 50/50; the contractor and the client would share every

energy dollar saved equally. Other contracts give the contractor more of the savings split, (70/30, 80/20, etc.) but for a shorter time. The most complex contracts involve a formula for payments that stipulates priorities among the lender, contractor, and client for shares of the savings until first the lender, then the contractor receives some target amount. (In all arrangements, at the end of the contract, all the savings accrue to the client.)

Guaranteed Energy Reduction

A shared savings contract may guarantee to reduce a client's energy use or energy bills by a stated percentage every year. The contractor expects to be able to do a much better job of saving energy than the guaranteed percentages and intends to keep the difference. Unless the contractor is willing to assume the risk of energy price fluctuations, however, the client faces the real risk that energy consumption will be reduced but net energy expenditures will still increase.

Fixed Fee Guarantee

This is a rare but most desirable contract from the client's perspective. The contractor quotes a fixed fee for all equipment services and guarantees that the fee will be less than the savings realized. The crucial factor distinguishing this type of contract is that the contractor assumes the risk of major energy price runups by guaranteeing cost reductions or positive cash flow or no net negative cash flow. If the contractor stipulates the value of his guarantee on the basis of costs to be avoided, but actually guarantees to reduce energy without regard to cost, it is not a guaranteed fee arrangement.

There are three factors (exclusive of facility usage) which influence energy bills: the energy efficiency of plant and operations; weather-induced energy use; and energy cost. All shared savings arrangements,

being performance contracts, place the responsibility for equipment performance on the contractor. The best deal for the client has the contractor assume all responsibility for efficient energy use within the normal range of building operations and the risk of weather extremes and increases in energy costs.

SAVINGS POTENTIAL

Currently available knowledge and equipment can reduce the conventional energy consumption of almost any sizable commercial or industrial building. The savings potential will vary with the type of building. Estimates vary greatly from one analyst to another.^{2,3,4,5} The Solar Energy Research Institute has estimated⁶ 25-30 percent of current commercial/industrial consumption could be cut with existing techniques, exclusive of cogeneration. Studies of the hospital sector indicate a savings potential between 20 and 40 percent.^{7,8,9} One respected energy engineer says, "there isn't a plant in the U.S. whose energy bill we can't cut by 20 percent annually."¹⁰ His methods involve only no-cost or low-cost, "brains and screwdrivers" work; with equipment changes, even greater savings are possible.

It is difficult to estimate the energy conservation potential of defense facilities. Most consumption data have been developed around an accounting system based upon Btu/sq ft, which has been revised several times. The accounting system was developed in response to a mandated energy conservation program (Executive Order 12003). Serious debate has developed about actual energy consumption reduction.^{11,12} Regardless of how much savings have been obtained, there is no information other than anecdotal¹³ to show how much more may be possible.

However, even if the potential savings are only 10 percent, with DoDs annual fuel bill of \$3.2 billion, the dollar savings are significant -- in

excesss of \$300 million. Every one percent of the fuel bill we save through improved energy management would release over \$30 million for other more important defense requirements.

Since savings are realized over time, it is usually necessary to consider the time value of money.¹⁴ Money received in the future is thought to have a lesser value than the same amount received now. The money in hand is worth more because of the other things it can be spent on -- for example, other investment opportunities. The money in the future has to be devalued or discounted to account for what it could have been earning elsewhere. This discounted value is computed by reducing the value of future dollars by a discount rate (based on the return on other investments, the cost of capital borrowing to the organization, or some computed proxy such as the figure OMB sets for the federal government), factoring in the time of receipt -- year 1, year 2, etc.

An important benefit of shared savings contracting is that even though capital improvements may be involved, no capital expenditure is required of the client. The contractor guarantees that annual, including first year, costs will be less than savings realized. Financing costs, if any, are figured into the shared savings contract so that the amount to be saved will usually cover all costs and still leave some savings for the client.

A critical consideration for institutional and government energy users considering shared savings contracting is whether they will really receive any meaningful benefit from the savings. Presuming that the contractor is offering a non-trivial share of the savings, there must be some way in which savings really accrue to the benefit of the client. If the savings only benefits a general fund, produce a budget surplus, offset other losses, or result in decreased reimbursements or budgets, only the most general sort of

benefit is realized. These general benefits are most certainly a concern -- especially when, for example, DoD energy bills constitute approximately 1.5 percent of the federal budget.¹⁵ However, the general benefit is frequently only lightly felt by those who actually do the work.

FACILITIES MAINTENANCE

Monies for the purchase of utility services and fuel supplies are authorized and appropriated to DoD under the Operations and Maintenance (O&M) budget item.¹⁶

Money saved within one part of O&M -- utility bills, for example -- would then be available to pay for other O&M activities. A shared savings contract under which the contractor provided energy maintenance services would have the multiple benefits of providing extra maintenance manpower (the contractor's), freeing existing personnel to do other maintenance and providing extra dollars (the savings) for other maintenance and repair projects.

REFERENCES

1. Klepper, Martin, Presentation to DoD, September 8, 1982.
2. U.S. House of Representatives, Committee on Energy and Commerce; Report on Building a Sustainable Future, (97-K); April 1981.
3. Northeast Midwest Institute; Balance or Bias: Building an Equitable Energy Budget, Washington, DC, p.20, 1982.
4. Solar Energy Research Institute, A New Prosperity; Brick House Publishing, Andover, MA, 1981.
5. Russell, J. W., Economic Disincentives for Energy Conservation, Environmental Law Institute; Ballinger, Cambridge, MA, 1979.
6. Published as Report on Building a Sustainable Future by the U.S. House of Representatives, April 1981.
7. Hirst, E., "Energy Audits in 48 U.S. Hospitals," Union Carbide Corporation, (U.S. Department of Energy Contract W-7405-eng-26), 1981.
8. U.S. Department of Health, Education and Welfare, Health Resources Administration, "Cost Containment in Hospitals through Energy Conservation," DHEW Pub. No. (HRA) 79-14511, 1979.
9. U.S. Department of Energy, Office of Conservation and Renewable Energy, "Energy Efficient Hospitals," DOE/CE-0003, April 1981.
10. Horowitz, Bruce, "When to Send for the Energy Doctor," Industry Week, p. 66, August 9, 1982.
11. U.S. House of Representatives, Committee on Energy and Commerce, op.cit.
12. U.S. Department of Energy, Office of Conservation and Renewable Energy, "Federal Building Energy Reduction, Objectives and Usage to Date," "656" Committee Meeting, June 24, 1982.

13. Mumford, Robert E., Jr., "Managing People for Energy Conservation," Defense Management Journal, Third Quarter 1981.
14. Community Energy Ventures, Guide to Energy Conservation Financing in the District of Columbia, Washington DC, Energy Office, 1982.
15. U.S. House of Representatives, Committee on Energy and Commerce, Wasted Energy Dollars in the Federal Government, (97-HH), July 1982.
16. Executive Office of the President, Office of Management and Budget, "Budget of the United States Government FY 1983," Washington, DC 20503, 1982.

2. ASSESSMENT OF SHARED SAVINGS CONTRACTING

In this chapter we describe the types of contract services that could improve energy efficiency under shared savings arrangements. We discuss the general advantages and disadvantages and note some strategic decisions and related procedural hurdles.

TYPES OF CONTRACTS

The types of services available on a shared savings basis fall in the following categories:

- Energy audits and technical assistance
- Energy operations and maintenance management
- Energy equipment financing
- Comprehensive energy services

In the following paragraphs, we describe these types and discuss the unique values and liabilities of each type as it relates to the DoD.

Energy Audits and Technical Assistance¹

Several businesses with process or building engineering expertise have developed an energy audit or energy engineering service whereby savings are guaranteed to be greater than the fee charged. Some organizations request a long-term agreement which pays them a royalty on energy saved for a period of years. Others simply warrant that the savings realized, either by the implementation of the no-cost/low-cost elements of their audit or by their actual interventions, will exceed the fee charged in the first year. These we refer to as "energy doctor" services.

In other words, these experts will survey a client's buildings and either recommend or implement changes that are guaranteed to save more than

the cost of the changes and the amount of their bill. The audit recommendations are, of course, only as good as the client's ability to put them into practice. The "energy doctor" or technical assistance contract represents a higher level of service -- removing the risk of a failure to implement recommendations properly.

Energy engineering is a newly developing specialty. There is no single place to go to learn all there is and become an expert. It is more typically a function of a great deal of self education and hands-on experience, and there are relatively few people who are able to do a thorough and reliable audit of a building and guarantee that their program will save money.

Since actual savings rely on implementation, the most certain savings and the most meaningful guarantees are those given by the person willing to do the work rather than one just presenting the client with a list of recommendations.

Energy Operations and Maintenance Management

A few companies offer contracts for the operation and maintenance of client facilities with a guarantee to save more energy dollars than the contract itself costs. These organizations² take over all energy-related maintenance, often placing their own managers on site. Their services include corrective and preventive maintenance, minor construction and alteration. This is an exclusive business for some; others do energy management as a part of a total maintenance contract. Those exclusively involved in energy management often emphasize studying and modifying the entire energy use pattern of the client in addition to simple operations and maintenance changes.^{3,4,5}

Energy Equipment Financing

Equipment financing businesses have been a small but steadily growing service industry. They were helped by several elements of the Economic

Recovery Tax Act of 1981 which simplified and speeded up depreciation rates.⁶ As a result of tax credits provided in the Energy Tax Act of 1978 and the Crude Oil Windfall Profits Tax Act of 1980,⁷ many different types of energy property are eligible for tax credits. A handful of businesses now specialize in financing acquisition of energy property by a shared savings arrangement. Some charge a flat fee, which is guaranteed to be less than savings -- often called guaranteed positive cash flow.⁸ Others use more complicated arrangements which involve investors, lenders, and clients sharing savings on a given, often variable, schedule.

Equipment financing services are only as good as: (a) the equipment itself, (b) the matchup between the equipment and the building, and (c) the maintenance and operation of the equipment after installation.

Too frequently, the equipment finance organization has a vested interest (perhaps as the manufacturer) in a specific piece of equipment. Unless the client is certain that this is the best equipment for his needs, equipment financing alone will be a risk. Also, if the maintenance and operation of new equipment are left to existing personnel, potential savings may not be realized;⁹ current staff may lack the capability or the motivation to keep the new system running right.

Comprehensive Energy Services

Existing in Europe and now developing in the United States is an array of companies offering audit, financing and maintenance services as a package.¹⁰ These companies have been called total energy management companies,¹¹ energy services companies,^{12,13} energy conservation companies¹⁴ and integrated retrofit delivery systems.¹⁵ In concept, they are contractors who will audit a client's building, design and install any modifications necessary, operate and maintain all energy use systems, and guarantee to do so

for some figure less than current energy use costs. They have the advantage, in their purest form, of providing a client with an expertly designed program of equipment acquisition and ongoing services. A comprehensive energy services company will focus on engineering, service and management improvements to a client's energy use systems and patterns.

Analysis of Alternatives

The primary question on which to focus our consideration is: "What does DoD need?"

The Services have the capability of doing or contracting for good quality energy audits for standard commercial buildings or industrial facilities. It would be more difficult for them to develop and retain a pool of energy engineers since those skills require considerable experience to develop and are well paid for in civilian life.

DoD certainly needs much new and more efficient energy use equipment, although it would be difficult to quantify how much and to specify what kind except on an installation-specific basis. DoD also needs additional operation and maintenance help, especially if new equipment is involved. New equipment with sophisticated control technology or high efficiency boiler/burners requires arrangements for maintenance services. Also, since no equipment is either infallible or foolproof, it makes sense to arrange for its proper operation and maintenance by people with an interest (via the shared savings contract) in keeping it in top form.

However, based on the difficulties we have encountered in determining energy use and savings to date, the concerns expressed by senior personnel about DoD energy consumption growth, and the multitude of different energy using facilities and activities, it would appear that DoD does not need audits, equipment, or services so much as improved energy management. This

improved energy management will require energy auditing, may involve getting and installing new equipment, and certainly should increase energy efficiency maintenance and equipment services. However, the basic emphasis needs to be on a total energy management or energy engineering package, including review and modification of energy use patterns, education and training of service and civilian personnel, and the other elements mentioned.

A shared savings contract with a comprehensive energy services company can be constructed to provide the necessary and proper mix of equipment changes, maintenance services, and management interventions. Since the energy use reductions will be guaranteed by the contractor, this assures better compliance with DoD energy conservation goals. Because the contract will require well established and accurately monitored energy use data, this is a means of improving management information quality. Since this contract will produce energy cost savings, the benefits will come at no net cost to DoD. Finally, if avoided costs are considered as a new pool of otherwise unavailable dollars, a new source of money for other expenses will be generated.

To answer the question originally posed: "What does DoD need?": DoD needs better tools for energy management. The comprehensive energy services company, which works on a shared savings basis, is one way to obtain that improved management at no cost, with a guaranteed reduction in energy consumption.

ADVANTAGES OF SHARED SAVINGS CONTRACTING

Several unique advantages to shared savings arrangements are generally valuable to any customer, and some are specifically advantageous to DoD. The overall advantage is the reduction in energy consumption and the improvement of energy management at no cost. Specific advantages of shared savings contracting are itemized below.

Capital Improvement

Almost every facility can benefit from improvement to and/or replacement of existing energy use equipment. Energy conservation programs that rely on operating and maintenance changes alone are limited in the savings to be realized. Besides, most analysts reasonably assume that the majority of the energy conservation attained to date in the United States -- including government energy conservation programs -- are due to operating changes (such as thermostat setbacks) already accomplished.¹⁶ In other words, the easy fixes (the no-cost/low-cost measures) have largely been done, though continued emphasis is needed to maintain these savings. The next increment of energy conservation will prove more difficult; it will require more expertise or skill, will require new equipment or retrofits, and will be more expensive. The Energy Conservation Investment Program (ECIP) alone has funded over \$1 billion (from 1976 to 1984) for energy conservation investments.

A shared savings contract with a comprehensive energy services company is attractive because it includes equipment acquisition and improvements in addition to management, operations and maintenance assistance.

No Capital Expenditure

Since the contractor warrants that the cost of equipment and services will be repaid out of savings realized, no capital expenditure is required. The contractor may be able to finance the acquisition of equipment at an annual cost that is less than the savings. Or, the additional savings generated by service and maintenance personnel may create a savings pool, in excess of payroll costs, to be applied to equipment acquisition costs. Furthermore, favorable tax treatment may reduce the cost of financing to below the value of energy savings.

The main advantage is that the client gets a capital improvement with no capital expenditure.

Maintenance Contract

The contractor should be required to provide operating and maintenance services, at the very least for any new equipment and preferably for all energy use systems.

The provision of maintenance under a guaranteed savings or shared savings arrangement means that maintenance work, which previously took personnel time, or contract payments, or was ignored, is now done by the energy services contractor at no cost. This frees personnel for other maintenance work, frees dollars for other maintenance or repair projects, and assures quality of work because the contractor has a financial stake in successful savings. Care is needed to assure the contractor does not neglect long-term maintenance requirements.

All Paid Out of Savings

The equipment and maintenance costs are to be paid out of savings realized by the installation of equipment and the provision of operating and maintenance services. There is no new or net cost. The contractor could be required to post guarantee instruments in the form of surety bonds, insurance policies, and manufacturer or installer warranties to protect the client from any cost.

This is the essential new element of these businesses. They make money by saving money, provide the client with services and capital improvements, and assure themselves of business and profit by capturing the savings potential (shown in Figure 1-3).

Guaranteed Savings

In some fashion the client is guaranteed to realize savings. Typical methods include: straight (50-50) share of savings; unbalanced share (70-30, etc.); shifting shares (90-10 in year 1, 10-90 in year x); guaranteed savings in actual energy used; fixed fee guaranteed to be less than savings.

Many, if not most, contracts contain factors for adjusting for variations in weather and energy prices. It is important to note the difference between guarantees of dollar savings versus guarantees of energy savings. The difference lies in whether the contractor is willing to absorb the risks of uncertain future weather and market conditions. Regardless of what guarantees the contractor offers, he should be specifically required to assure the client that if he (the contractor) is unable to fulfill the contract, he or his insurance carrier will restore the premises to their previous operating condition at no cost. A cap or limit on total contractor fee may be appropriate for large scale projects.

The contractor may offer only little financial benefit but great energy savings or vice versa. It may be that in early years most of the financial benefits flow to the contractor, but that at some particular time the contractor turns all savings over to the client. In any case, the contractor should be required to guarantee that the client will at some time realize savings in dollars, immediately realize savings in energy, and never face increases in costs except for increases in energy use due to preselected causes, e.g., fuel price increases. It should be noted that no such legally meaningful guarantees are possible from employees.

Shifts Risk to Contractor

The energy management assistance available from an energy services company provides a client with expertise in the complex and rapidly growing field of energy technology. During the last ten years, as energy has increased in price 5 and 6 fold, the number of new techniques and technologies to save energy has increased even more.

A comprehensive energy services company taking an engineering management approach to energy conservation will make the best matchup of equipment changes, services and management interventions for a client. Successful

companies are able to acquire the most up-to-date product information and the most skilled personnel in a way that many clients cannot.

The energy services company is hired for its expertise; it is responsible for designing, installing, operating and maintaining facilities in a more energy efficient manner. The responsibility for error, performance deficit, or dysfunction is placed by contract on the contractor. The contract should also specify, as discussed above, the risk protection coverage provided the client by the contractor. Specifically, the contractor should be responsible for the savings guaranteed, the installation and performance of the equipment, the level of thermal comfort, continuation of building operations related to energy, contingent liabilities and repairs in case of dysfunction, and the performance of any subcontracted activities.

Provides Immediate Savings

Shared savings contracts provide, at the very least, energy savings in the first year and usually dollar savings or avoided costs. This means not only that clients have no net costs, as mentioned above, but also that there is an immediate reduction in energy use in the first year of the contract.

Financing an energy project from internal funds incurs a current expense typically well in excess of first year savings. Thus, it takes several years to return or pay back the investment.^{17,18} Although DoD does have an amount of money from the Energy Conservation Investment Program, shared savings energy services contracting provides another method by which energy conservation projects can be funded without using ECIP money. Since an energy services contract can be implemented more quickly than an ECIP project can be developed and funded, immediate savings are realized that might otherwise be lost.

Purchases Incentivized Management

By contracting with a private business for the provision of energy efficient thermal comfort, a government agency is able to get the benefit of incentives that do not exist in the public sector. Obviously profit is a strong motivator; so is job security. As one executive of an energy service company said, "If our people produce the savings we guaranteed, they get to keep their jobs."¹⁹

Frees Dollars for Other Use

If we can get a private company or individuals to invest money in public facilities or services which meet publicly set standards of performance and cost, then scarce public dollars which otherwise would have been to spent there can be spent elsewhere. "Elsewhere" can be other necessary repairs and maintenance that are not energy related, or it can be other energy projects whose longer term payback is not attractive to private investors.

DISADVANTAGES OF SHARED SAVINGS CONTRACTING

Advantages do not come without costs and risks. While the advantages can be fairly easily identified, not all the drawbacks and problems can be determined and described in advance. The reason is essentially that this kind of contracting is both new and different.

It Is Different

For the most part, service acquisition contracts operate on an established fee basis, whereas the type of arrangements we are talking about typically does not have a set fee. The fee paid the contractor may vary during the life of the contract, and the fee schedule of any two contractors proposing the same services are likely to differ.

Since this is a new type of contracting for everyone, not just for DoD, there is little guidance available. Indeed, LMI's research is one of

four efforts, recently begun, to look at shared savings contracts by²⁰ Blue Cross of America/Blue Shield of America for DOE,²¹ the Technical Development Corporation for the New York State Energy Research and Development Authority,²² Lane and Edson PC also for DOE, the National Community Energy Management Center²³ in conjunction with the National Institute of Governmental Purchasing. These other efforts will result in documents including generic materials for their particular focus -- hospitals, multi-family dwellings, municipal governments -- in the next three months to a year.

In addition to a different payment process and a new type of contract (i.e., for performance and thermal comfort rather than to design and build), developing and executing such contracts means doing something different. It means disrupting business-as-usual.

The Money Source Is Avoided Costs

Avoided costs are not true revenues. They are not new dollars received from an outside source; they are dollars already within the budget for another purpose -- in this case, paying energy bills.

Using saved energy dollars to pay for improved energy management has a great deal of logical appeal, but it requires some changes in accounting. First, there must be a means of identifying real projected energy costs. Next, these dollars must be set aside as a pool of money from which the energy service company's bills would be paid. In other words, the amount of money which would otherwise have been spent in each year the contract is in force must be counted as an avoided cost.

This novel accounting process may take time to develop and may be difficult to integrate with existing financial control practices. For example, the regulations and procedures governing cost comparisons do not apply to shared savings contracts since there are no new costs.²⁴

Some Savings Are Given Up

The contractor makes his money out of the savings the client could realize if he could do it himself. These companies appeal to organizations that have limited access to capital, an inability to use certain tax benefits, a lack of requisite skills or personnel, an interest in minimizing their own risks, and a desire to save energy.

The client agrees to give up all the savings he could realize by doing it himself in return for avoiding the capital cost or the risk. When the client is DoD, we must ask whether DoD should allow businesses to make money out of its inefficiency in order for it to avoid capital investment and risks associated with the management of its own facilities.

The policies and procedures in Circular No. A-76 affirm the federal "reliance on the private sector". But it remains to be determined whether the savings given up by the energy-using client (in this case DoD) and tax revenues lost to the Treasury are worth the energy saved and other benefits.

Typically, the contractor will wish to get more money as energy prices rise, especially if the contractor is paying the energy bills. However, if energy prices rise precipitously (as they did twice in the 70's for oil and will certainly rise again in the 80's for gas and certain electric utilities' customers), the contractor may get a windfall.

Operations and Maintenance Are Contracted Out

This is apparently more of a problem for the General Services Administration than for DoD since the Department has many existing facility maintenance service contracts. However, a new contract with an energy services company must take into account both existing maintenance contracts (when they expire, whether they can be subordinated or renegotiated), and existing personnel assignments. The last item is clearly a difficult problem because of civil service procedures and protections regarding displacements.²⁵

Government Relies on Privately-Owned Equipment

Unlike some state and local governments, the federal government has no general prohibitions against a private corporation or concessionaire owning equipment placed on government premises and used by government personnel. Tax issues aside, DoD ought to be concerned that any equipment upon which it would rely for essential and, especially, emergency activities are certain to be functional and secure. No contract should be entered that could breach or threaten security or readiness.

The Market Is Not Mature

Energy services companies and shared savings contracts are new and rapidly growing market entries. No one method of contracting or type of company has established pre-eminence in this field. Their novelty not only means great variety and flexibility but also insecurity. Some early contracts have fallen through disastrously,²⁶ and some pioneers are out of the business.²⁷ Not only is there danger of any given company going out of business, for lack of business, but there is also danger in too rapid growth.²⁸

There Are Transaction Costs

As a result of the newness and uncertainty of such contracting, developing an effective, prudent, and realistic contract between a DoD facility and a comprehensive energy services company will take time and money. These transaction costs will occur as the first Request for Proposal is written, the first contract documents prepared, the first site and contractor selected, and so on. All subsequent work can follow the mold or the guidance developed, but the pioneer effort will involve careful thought, planning and evaluation.

There May Be Policy or Procedural Issues

We have attempted to identify and recommend techniques to resolve all major impediments. However, it is not possible to foresee all the

potential hazards of a new course of action. We have identified the following policy concerns and procedural functions as possibly affected by the idea of shared savings energy service contracts.

Capital Acquisition. Under current law and regulations, Congress and the Office of Management and Budget are responsible, respectively, for legislative and executive oversight of capital acquisition. If energy services contracts result in the acquisition of capital stock without the review of these offices, has their authority been subverted? Allied to that is the more difficult question of whether the contract is a capital acquisition or a service contract.²⁹

Tax Revenues. The equipment that an energy services company would seek to install often enjoys favorable tax treatment. Indeed, some energy services companies have been set up simply to take advantage of such benefits. The United States Treasury Department may be concerned if DoD plans to give businesses the opportunity to aggregate large tax benefits. The Department of Housing & Urban Development has examined this issue vis-a-vis the use of energy services contracts in public housing.³⁰

DoD Accounting. A new accounting method or process will have to be developed to manage the "avoided cost pool" discussed previously. The accounting may also have to address the value of any capital share developed under a shared savings contract, if expenditures authorized for energy costs are really being spent to acquire an interest in a piece of equipment.³¹

Leadership Is Required

Business as usual cannot meet the challenge of addressing these problems, making the decisions, and surmounting the hurdles discussed below. A decision to proceed and manpower to support that decision are necessary. No reasonable amount of study can answer the questions and test the advantages

posed by shared savings energy services contracting. What is needed is an exploratory, action research effort to implement and simultaneously evaluate shared savings. This will take leadership in the form of a decision and authority to proceed, and some reasonable level of staffing to do it right.

FACTORS IN IMPLEMENTATION

Reliable, Effective Contractors Exist

Studies by various organizations^{32,33,34} over the last year have tried to develop an exact list of contractors who offer shared energy savings arrangements and to take some measure of their effectiveness. Drawing from these studies, from files developed by LMI and other professionals, and from a mail-in survey conducted by LMI during this project, we developed a list of potential suppliers of energy services. This list and its sources are presented and discussed in Appendix B.

While we were not able to contact and research all the companies claiming to be shared savings energy services organizations, we were able to satisfy ourselves with first hand evidence that many solid, reliable and proven energy services firms exist, and that properly structured, new organizations could be developed out of existing engineering and financial professional practices to provide competent energy services.

Contract Arrangements Can Vary

Different businesses offer varying energy services and payment schedules. Contracts for engineering management services are especially flexible to accommodate particular organizational and facility requirements.

It is clear, from our discussion below, that DoD must place many restrictions and requirements on energy services contractors. However, our research indicates that it will not be difficult to get the type of contract arrangements DoD procedures and prudent management dictate.

DOE-GSA Study

There is currently a cooperative work effort between the Department of Energy and the General Services Administration with which the LMI project has also been cooperating. This combined united effort is attempting to explore the use of private services and financing contracts for federal building energy efficiency improvements. The advice and assistance from DOE has been helpful in guiding our efforts. Together with DOE, we have tried to keep our work complementary and mutually supportive. The personnel involved in the DOE-GSA work and the progress or problems they experience will be a learning resource for the Department of Defense.

DECISIONS AND OTHER HURDLES

Several strategic or policy decisions face DoD in considering shared savings contracts.

Saving Dollars vs. Saving Energy

The techniques and terms used by different companies vary greatly. Different pieces of equipment have different effects on energy efficiency and are treated differently for tax purposes. Two or more different energy services proposals will have different energy and dollar savings projected. Some will save more money than energy, others the opposite, and all will likely differ on the schedule on which savings occur and are shared. DoD's immediate emphasis should be on cost savings.

Site Selection and Contract Development

The general business of energy services has developed from experience in commercial office, general institutional and industrial facilities. Selecting a site and developing a contract appropriate to the application of this technique to military facilities will require special care. Recommendations and guidance in selecting a site and contracting are discussed in Chapter 3.

Contract Length

DoD does not face the prohibition most state and local governments do which forbids multiyear contracting.³⁵ However, the question of contract length is still important because it influences the payback to the contractor, which in turn influences the mix of services and equipment provided to the client. Longer contracts will support bigger ticket equipment improvements. No energy service company will install a five-year payback item under a five-year contract; this gives no margin for error or profit. Two- to three-year paybacks are the norm for five-year contracts; five-year average payback programs usually entail a contract of seven or more years.

Baseline and Monitoring

Any shared savings arrangement will succeed (or fail) on the strength of its baseline data and monitoring techniques. Chapter 4 covers this topic in technical detail. It will be an important part of any contract development process to establish the actual base year energy consumption and to set in place the methods by which current energy consumption data and information on other building and use factors are maintained.

Facility/Mission Changes

This is the most serious concern facing DoD contracting on a shared savings or performance basis. Not only may building use change because of equipment changes or mission changes, but the regular reassignment of officers also changes direction and style of management.

More threatening is another type of change -- the changes in the standard operating procedures that base personnel may not be willing or able to make. The energy services contractor will be a highly motivated energy expert. The flight mechanics and repairmen may have a different set of priorities. For example, the hangar doors may be left open a lot more than

the contractor likes.³⁶ If the contractor concludes that the base personnel are offsetting increased equipment and service efficiencies with large use inefficiencies, he will seek a change order on the contract. The potential for such changes, if not controlled, seriously undermines the value of these contracts.

DoD Procedural Changes

Developing and administering a shared savings contract can certainly be done within existing procedures. However, existing procedures may have to be modified and melded somewhat. It will require a unique accomplishment to fit an incentive payment system onto a facilities maintenance contract to be let strictly on the basis of performance standards. Also competing proposals will have to be evaluated for costs/benefits, even though current cost comparison and life-cycle costing techniques are not directly applicable. Finally, a method will have to be developed for the accounting of the contract and its savings. Researching, documenting and authorizing these procedural changes will take time and effort.

Utility Contracts/Bulk Purchases

Some shared savings arrangements entail the contractor's purchasing the client's fuel and utilities. If there are existing contracts with utilities or suppliers, they will have to be renegotiated. If the utility service is part of a large regional contract, the renegotiation may be difficult.

Existing Assignments and Contracts

Personnel assignments are a bigger problem than contracts since the latter can always be renegotiated. A successful shared savings contract requires cooperation between building staff and contractor. Personnel changes may be out of the question.³⁷ The ideal arrangement would delegate all energy use equipment as the responsibility of the contractor.

How Much Checking? Who Pays?

DoD needs to be certain that the contractor's proposals are both appropriate and likely to be effective. When the contract is in effect, DoD needs to be sure of the amount of energy actually being saved. It needs also to be assured that the financial operations of the contract and the contractors do not cheat, disrupt, or embarrass DoD.

If impartial third parties (such as auditors and accountants) are required to handle that assurance, the cost to DoD will take the form of lower savings, as the companies factor bonding and insurance costs into their bids.

REFERENCES

1. Horowitz, Bruce, "When to Send for the Energy Doctor," Industry Week, p. 66, August 9, 1982.
2. Service Master Industries, Inc., marketing brochures, Donners Grove, IL, 1981.
3. New Energy West, Inc., marketing brochures, Mill Valley, CA, 1982.
4. Penn Energy Corp., marketing brochures, Bradenton, FL, 1981.
5. The Synectics Group, marketing brochures, Washington, DC, 1982.
6. Klepper Martin, "How to Make Energy Conservation Pay for Itself," National Community Energy Management Center, Washington, DC 1982.
7. Brown, S.P.A., and Anandalingam, G., "Economic Analysis of Tax Credit Incentives for Business Investments in Energy Conservation and Development," (BNL-51526) Brookhaven National Laboratory, Upton LI, N.Y., 1981.
8. Honeywell Corporation, marketing brochures, Minneapolis, Minn, 1982.
9. Liss, Lawrence, "Financing Commercial and Industrial Energy Management," Conference on Innovative Strategies for the Eighties, sponsored by the National Community Energy Management Center, May 1982.
10. Sant, Roger W., "Coming Market for Energy Services," Harvard Business Review, Cambridge, MA, May-June 1980.
11. Solar Energy Research Institute; Innovative Commercial Retrofit Delivery, Golden, CO, 1982.
12. Greider, George M., "Energy Services Companies; The Value for Public & Non-profit Energy Users," Proceedings of the Conference of Local Energy Officials, Knoxville, TN, 1982.
13. Yewell, John W., "Money for Energy Conservation," CEFP Journal, International Council of Educational Facilities Planners, Columbus, OH, July-August 1982.

14. McDonald, Norris, "Energy Efficiency Strategies for Multifamily Rental Housing," Environmental Policy Institute, Washington, DC, September 1981.
15. Roth, Dubinsky, Bodilly, "A Description of Integrated Retrofit Delivery Systems and Innovative Conservation Services Programs in Selected Localities," a RAND note (N-1673-DOE), Santa Monica, CA, March 1981.
16. E. Hirst et al., "Energy Use from 1973 to 1980: The Role of Improved Energy Efficiency," (ORNL-CON-79), Oak Ridge National Laboratory, Oak Ridge, TN, December 1981.
17. Community Energy Ventures, Guide to Energy Conservation Financing in the District of Columbia, Washington, DC Energy Office, 1982.
18. Corcoran, Stanley, "Financing Energy Conservation in Municipal Buildings: Which Road to Take?" Massachusetts Executive Office of Energy Resources, Boston, MA, 1981.
19. Arthur Lennon, Vice President, Scallop Thermal Management; private communication, April 1982.
20. Maturi, Richard, Blue Cross Association/Blue Shield Association, 676 North St. Clair Street, Chicago, Ill., 60611; and Mr. Richard Minning, U.S. Department of Energy, Office of Institutional Conservation Programs, 1000 Independence Avenue, Washington, DC, 20085; private communications, 1982.
21. Dayton, David, President, Technical Development Corp., 11 Beacon Street, Boston, MA 02108; private communication, 1982.
22. Klepper, Martin, Lane and Edson P.C., 1800 M Street, N.W., Washington, D.C., 1982
23. Dickman, Donna McCord, National Community Energy Management Center, 400 N. Capital Avenue, Washington, DC 20001, and Mr. Steven Gordon, National Institute of Governmental Purchasing, 1735 Jefferson Davis Highway, Suite 101, Arlington, VA 22202; private communications, 1982.
24. Executive Office of the President, Office of Management and Budget, Circular A-76: Policies for Acquiring Commercial or Industrial Products and Services Needed by the Government, March 29, 1979 as revised; and U.S. Department of Defense, DoD In-House vs Contract Commercial and Industrial Activities Cost Comparison Handbook, DoD 4100.33-H, April 1980

25. Ibid.
26. Cohn, Lisa, "Tax Scheme Threatens Shared Savings Jobs," Energy User News, April 12, 1982.
27. Shoshkes, Deena, "EBASCO Opts to Eliminate Energy Group," Energy User News, October 10, 1981.
28. Klepper Martin, p. 31, 1982.
29. Warren Weil Associates, Inc. "Interim Report on Feasibility of Using Off Budget Financing to Retrofit Federal Buildings for Increased Energy Efficiency," (DOE Contract DE-AC08-80CS-21388), March 1982.
30. The Synectics Group, Inc., "EMC Financial Model Scenarios," TSG, Inc., 1130-17th Street, N.W., Suite 400, Washington, D.C. 20036 for the U.S. Department of Housing and Urban Development, Office of Planning Development and Research, 7th & D Streets, N.W., Washington DC 20036
31. Eden, C., Gregory, H. and Bond, Kenneth, Tax Exempt Municipal Lease Financing, Law Journal Seminars Press, Inc., New York, NY 1980.
32. SERI, 1982, op. cit.
33. General Public Utilities Corporation, "GPU Catalog of Innovative Conservative Financing Companies," Parsippany, NJ, 1982.
34. Baum, Dan, "Unconventional Financing Aids Capital Short Users," Energy User News, September 14, 1981.
35. cf. 10 USC 2306 H and Defense Acquisition Regulations DAR-1, 1-322 at 1.40A.
36. Mitchum, Commander William R., Director, Energy & Utilities Branch, Naval Facilities Engineering Command, Alexandria, VA; private communication, 1982.
37. OMB A-76, loc. cit.

3. PILOT PROJECT: IMPLEMENTATION GUIDELINES AND WORK SCHEDULE

INTRODUCTION

We view shared savings contracts as an energy management tool with many potential advantages to the Department of Defense. It is reasonable to expect that energy services contracting will be able to save the Department a great deal of energy and money.

Although there are costs and risks associated, we feel the benefits outweigh the costs and that the risks are manageable. However, because of the novelty of the idea and the complexity of the management environment, we recommend some preliminary testing. Since we know some candidate sites are interested in developing an energy services contract, we suggest that an action research program be undertaken to develop at least one and no more than three shared savings pilot contracts. Associated with the process of developing the pilot projects should be an allied and integrated study plan to resolve identified and emergent policy and institutional problems, to evaluate the pilot project experience, and to provide documentation and guidance for subsequent contracts, if any.

The following sections present guidelines for contracting and site selection and a proposed work schedule for a pilot project.

CONTRACTING GUIDELINES

In testing the effectiveness of shared savings contracting as a means of improving DoD energy management, we expect to save money. However, the testing process must minimize the risk to DoD to the point of being economically fail-safe.

Existing Procedures

To the greatest extent possible, the accounting and contract forms and procedures should be those currently in use. All the major elements necessary to develop, let, and administer this type of contract are already in existence. However, those elements will need to be assembled, fitted together and approved. A shared savings energy services contract could be constructed as a facilities maintenance contract with a target fee/target price payment schedule.¹ Present accounting procedures in at least one of the services allow base commanders to retain a share of any cost savings they realize.² Chapter 4 discusses other procedures that can be used.

Contract Goals: Cost and Energy Savings

Cost savings and efficiencies are DoD's most pressing needs and should be given top priority in shared savings contracts. However, energy savings are also important, and should be given priority, particularly for contract arrangements that depend greatly on tax credits and depreciation. Energy savings are important for meeting DoD energy conservation goals, especially if most of the no cost/low cost conservation opportunities have been exhausted, as some suggest.

Services and Equipment

Shared savings contracting should not be used merely as a way to finance equipment acquisition. Such acquisition would probably run afoul of many Congressional and executive powers and privileges. At the very least, the idea of off-budget financing should be addressed by interested government agencies and their counsels before the federal government begins financing any capital acquisitions this way.

Properly serviced equipment is essential to a successful energy management program. The unique value of the shared savings approach is its

potential use to purchase expert energy management help, new equipment and additional maintenance at no cost.

Energy Services vs. Equipment Financing

Under the tax code there is a substantial difference between an energy service company and an equipment lessor. Energy services companies are, in theory, treated more favorably; however, they must qualify as a service company. More than a few companies currently calling themselves energy services companies probably would not qualify. The most common model is based upon guidance gleaned from the so-called Xerox³ case. Such a model has not been approved by the IRS.⁴ To the extent that an energy services company's viability or profitability is based on an incorrect reading of the tax codes, that company is a bad business risk.

The problem in dealing with companies which only finance a single product -- those manufacturing or selling only one piece of equipment or one type of system -- is that their solution may not fit the client's problem, no matter how hard they try to engineer it.

The contract work specification should emphasize the need for comprehensive engineering and management services. The DoD should require all companies to demonstrate that the financial stability of any third party financing does not rely on the availability of tax credits.

Five to Seven Year Contracts

Anything shorter than five years would hold the company to very short term payback items, with a definite emphasis on services and little in the way of equipment retrofits. Longer periods than seven or, at the most, ten years would reverse the emphasis leading to major re-engineering and design modifications of facilities. A better procedure would be for the concept to be tested and validated in a short period of time. Then a longer term contract could be developed in the second generation, if any.

Under 10 USC 2306 H, the DoD has the authority to enter into a contract for operations and maintenance for up to five years. (See Chapter 4 for a full discussion.) A slightly longer term would be preferable, especially if more than one contract could be let -- say, one set for five years, another for seven. This would allow a test of the effect of contract length on savings.

The Department should reserve the right to invoke a hold-harmless guarantee and cancel the contract for nonperformance at no cost. The contractor would probably require a buyout or damages fee if the contract were canceled short of term for reasons other than nonperformance.

Risk Management

DoD cannot avoid facing some risks in shared savings energy services contracting. Some of these can be controlled in the process of contractor selection (see Evaluation Criteria, below). Other risks can be ameliorated by the strategic choices discussed in the previous five sections. The possibility of risk of an insufficient number of providers or contractors⁵ is negated by the list of energy services companies in Appendix B. Use change management and financial protection strategies are discussed in the next two sections. In them we consider the general question of how to manage the risks of energy services contracting.

The contract risks involve equipment, financing, operation and maintenance, and liability. The equipment must be correctly chosen and sized, properly installed, and correctly maintained and repaired in order to perform. If it does not perform to expectation, the contractor should have the responsibility to reimburse DoD for any costs incurred due to higher energy consumption and to either correct the nonperformance or remove all equipment at no cost to the Department.

The financial arrangements by the contractor for equipment and operations must be stable, evidenced by corporate security, equipment manufacturer warranties,⁶ financing insurance,⁷ surety bonds,⁸ letters of credit,⁹ or such other measures or combinations to assure that DoD will receive the energy savings promised or an equivalent reimbursement in dollars. Each bidder's proposal should indicate how DoD shall be so indemnified and the contract should then so specify.

The operation and maintenance of installed and existing equipment should be the responsibility of the contractor. The risk of lack of expertise or motivation of his employees should be borne by the contractor under his performance guarantee. However, the motivation of base personnel to cooperate with the contractor is a separate risk which would be difficult to assign to the contractor.

The best incentive to motivate civilian and service personnel is a reward system coupled with education and training. The contractor should be responsible for the energy-related education and training. But there should also be developed some method whereby cooperating commands would be rewarded from the Defense share of energy savings. Outstanding individual or unit cooperation could be rewarded by something like the Beneficial Suggestions¹⁰ system; the personnel evaluation system is also a way to reward individuals. Making energy conservation achievements a formal part of base or facilities command evaluations could be highly motivating.

The energy management reports filed by the contractor should address desirable operation changes, new or emerging equipment investment opportunities, and training provided and needed for base personnel. These reports should also address the cooperation of base personnel with the energy effort.

The liability for any contractor or subcontractor activity, equipment performance or failure, and any consequences thereof must be borne

by the contractor. Potential contractors should be required to demonstrate adequate insurance coverage for these contingencies to qualify as a bidder.

Use and Change

First, a well established baseline consumption figure must be agreed upon. Tied to that figure should be good data on personnel strength, operations and equipment inventory. Then, actual energy use as well as changes in personnel, operations and equipment must be accurately monitored. The ideal method would involve consistent data developed over two or three years on all elements. However, a proxy or simulation may be necessary (see Chapter 4). We feel that existing techniques will suffice to establish and monitor use.

The problem of use changes is more difficult. The most reasonable procedure is to agree on a definition of the current use and to require that the burden of proof for use changes be placed on the contractor. The contractor would be required to identify and measure any element of operation affecting or likely to affect energy use. This requirement as well as the requirement for monitoring energy use may be subcontracted at contractor expense to a third independent entity with the approval of DoD. An even more secure but more complex arrangement would require a third party subcontract for baseline, monitoring, and change assessment.

Use changes and change orders cannot be eliminated. An important element of the study and evaluation work of the pilot project will be to determine if the changeable nature of Defense operations precludes or limits the use of shared savings energy efficiency contracting.

Financial Safeguards

DoD should require full access to all accounts and records of the contractor, including but not limited to: energy use data; payments to utilities and other suppliers; sources and amounts of capital invested; return on

investment; subcontract and service arrangements; operating costs and cash flow. This accounting should be professionally certified by an independent firm or individual, and the cost included in the contractor's expenses.

There should be a "circuit-breaker" accounting mechanism that will limit the benefits to the contractor if rapid energy price runups occur, so that the contractor does not stand to reap windfall financial benefits unrelated to energy conservation.

A specific guarantee in all contract offerings should stipulate that the Department shall in no case incur any new net costs as a result of the contract. If the contractor cannot perform as promised, he should forfeit bond in the amount of savings promised and be required to return the facilities in question to their previous condition and operation at no cost to the Department.

Evaluation Criteria

Contractors should be selected by a two-step process based on how each proposes to achieve energy conservation goals set by DoD.^{11,12} The first step would evaluate all contractors on the basis of references and credentials, guarantees and insurance provided, and financial stability. The second step would compare the amount and value of the energy savings each proposes to provide.

References and credentials would include corporate experience, background of principals, information on subcontractors, and a confidential listing of former clients to be contacted for reference as to performance.

All guarantees, and any performance upon which they depend, shall be insured, and proof of such insurance provided. In addition there should be specific language indemnifying the Department for any related loss or cost either under the contract or resulting therefrom. Financial stability shall

be demonstrated by appropriate guarantees and bonds and by the contractor's equity position in the contract operations.

After a pool of eligible contractors has been selected, each should be evaluated, not on the basis of how each will save energy, but on how much energy will be saved, on what schedule, at what cost in dollars. In essence, DoD should stipulate a target amount of energy to be saved either in every year, by the end of the contract period, or at selected points. Proposals can be compared on the basis of an artificial calculation of the net present value of energy saved. Evaluations should select the proposal with the highest energy cost savings.

In a comparison of different arrangements it will be important to take into account the effect of exercising buyout options and to allow for contracts of differing length. This will require the development of some hypothetical factor to account for the difference between contractor maintenance services and employee O&M.

Finally, sensitivity analyses should be performed on: (a) the impact of rapid energy price escalation on contractor revenues, to test the worth of each contractor's circuit-breaker mechanism; and (b) the "wobble" (or estimation of error) in contractor guarantees.

A single contractor must be selected for any one site. It is simply not possible to manage multiple shared savings contracts due to difficulties in allocating responsibility for changes in energy consumption.

Study Plan

To assure that adequate data are produced for evaluation of the pilot project, it should be designed and administered to include study. Study goals should be explicitly established ahead of time and the sources and means of developing necessary information identified. An excellent method of evaluating the effectiveness of energy services contracting would be to compare the

pilot project site with a similar site undergoing an aggressive internal program of energy conservation; both should then be compared to a group of similar facilities presumed to be doing business as usual.

Because of the possibility of unforeseen institutional impediments and unresolved policy implications, the pilot project and its evaluation study should be organized around prescribed decision points at which go/no-go decisions must be made. These points and the intervening work steps are discussed later under Work Schedule.

Research and evaluation should be documented to support decision making, to record the study itself, and to provide guidance for the next generation of contracts if the study concludes positively.

A major element of the pilot study will be the provision of technical assistance to the base or bases chosen as sites. Base personnel will have little reason and few resources to go through the complexities of this new type of contract and will need assistance. Regional personnel should be involved in this technical assistance effort to assist as well as to learn.

SITE SELECTION GUIDELINES

Size of Project

The site or sites selected should be attractive to the contractor because of high energy use per square foot and average or above average utility and fuel prices. We recommend a site with a \$1 million minimum annual energy bill.

Mission

The facilities chosen should have a steady mission for the foreseeable future -- at least through the five to seven years of the contract life. Hospital facilities at a training command are excellent examples.¹³ Nonsensitive office buildings, base community and recreation centers, base exchanges,

and, generally, headquarters and training facilities are also candidates. Government owned and contractor operated (GOCO) plants might also be worthwhile.

Metering

It is most desirable that meters be in place and baseline energy consumption data be available for the previous two or three years. Once the contract is executed, meters must be in place, although baseline consumption data can be developed by proxy (discussed in Chapter 4). However it would be much preferable to have the data from metering and use the two sources -- meter data and proxy figures -- as cross checks for use changes.

Compatible with Base

As noted above, the energy services contract must be compatible with the base plans for the period of the contract and also compatible with the existing contracts and personnel assignments. Contracts for energy-related equipment service or facilities maintenance already in force will have to be renegotiated. There must be authority and willingness to do this. Existing base personnel should be willing and able to participate in a shared savings energy services contract for a pilot project.

Number of Sites

It would be valuable to have more than one site, more than one length of contract, more than one service as a client, and more than one type of building in the pilot project. However, because contract development and administration will be both time consuming and unique to each pilot contract, it is neither feasible nor reasonable to pursue a large number. Three is probably a reasonable upper limit to the number of sites and would allow more than enough variation in conditions.

PILOT PROJECT WORK SCHEDULE

The pilot project is viewed as an action research project to test the feasibility of the use of shared savings energy services contracting by DoD. In trying to develop and execute a contract while researching and attempting to resolve known and emergent problems, the feasibility can be tested one step at a time. The process can be halted at several points prior to or after contract award. The research, development, and evaluation work is organized around these decision points.

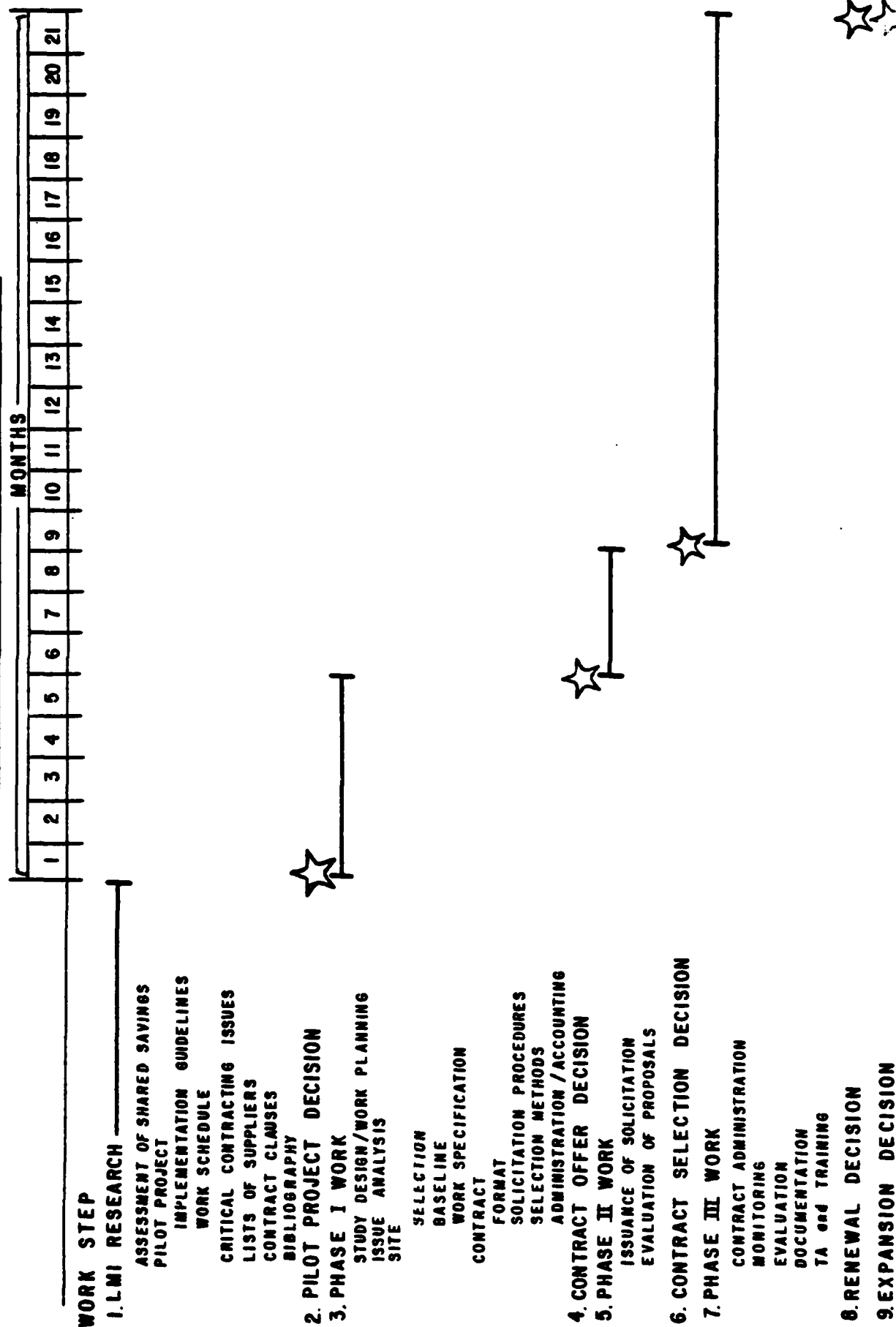
The length of time between the decision points is a function of the work to be done and the manpower available to do it. In setting these milestones we have assumed optimum staffing and projected a 21-month period from the project's beginning to the end of the evaluation of the first contract year. The work load would require at least one and perhaps two full time persons for this trial period, depending on the number of project sites and the details of work to be done. The proposed work schedule is shown in Figure 3-1.

Step 1. LMI Research

As a part of Task Order ML207 (MDA 0166-42) the Logistics Management Institute has researched and evaluated the applicability of shared savings energy conservation services contracting to DoD facilities. The substance of this work was presented at a briefing to DoD on September 8, 1982 by LMI staff and consultants. This report formalizes that material and provides:

- Introduction to Shared Savings
- Assessment of Shared Savings Contracting
- Pilot Project: Implementation Guidelines and Work Schedule
- Critical Contracting Issues: Immediate and Long Term
- List of Energy Services Companies Offering Shared Savings Contracts

FIGURE 3-1 PILOT PROJECT WORK SCHEDULE



- List of Companies Providing Energy Accounting Systems
- List of Requisite Contract Clauses
- Bibliography

Step 2. Pilot Project Decision

Upon receipt of this report the Department can decide whether it wishes to pursue the pilot project.

Step 3. Phase I Work

During this five-month period, four parallel efforts are required: (a) define the study plan and allied work effort; (b) select the site, develop baseline data and work specification; (c) establish a contract format, solicitation wording, evaluation methods, and administrative and accounting procedures; and (d) research the policy issues raised by the use of this new technique.

Step 4. Contract Offer Decisions

At this point, the responsible Service procurement officer will have to decide if any good reason exists for not requesting proposals for shared savings energy conservation services. Only a major administrative impediment (any of which should be resolvable in time) or a serious policy reservation should prevent issuing an RFP (and continuing the study).

Step 5. Phase II Work

In the beginning of this four-month period, the Services would issue a solicitation and provide a great deal of information and guidance to potential contractors. Once the proposals have been received, the task of the pilot study staff will be to compare and evaluate the various proposals and recommend the best.

Step 6. Contract Selection Decision

Presuming that there are responsive bids, that all the safeguards are in place, that analytic methods favor some contractor(s) over others, and

that administrative and accounting procedures are developed, it should be easy to decide whether or not to proceed.

Step 7. Phase III Work

During the first year of the contract, the monitoring and evaluation work should be oriented toward determining the value of continuing or expanding such contracts and documenting how the next (if any) contracts should be handled. In addition, there will be contract administration work as with any contract -- accounting, payment, reports, etc. Finally, there will have to be some continued assistance to base, regional, or command personnel working with the new contract management.

Step 8. Renewal Decision

At the end of one year, there should be an explicit decision made whether to renew the contract or not. If the contract has not worked, the Department should terminate it.

Step 9. Expansion Decision

If the pilot project has demonstrated significant and valuable energy savings and energy management improvements, DoD should decide whether to develop a standard set of procedures based on this experience for other Defense installations to use in energy efficiency improvement programs.

CONCLUSION

This pilot study design will allow DoD to explore an innovative and promising concept -- shared savings energy conservation contracting -- at little cost and with no perceivable risk. The project can be halted at any one of several points and can be designed to have an exhaustive variety of financial safeguards.

REFERENCES

1. Krochalis, LCmdr. Richard F., Bureau of Medicine and Surgery, Department of Navy, Washington, D.C. 20372; private communication, 1982.
2. Lengel, Ms. Joan, Research Director, Logistics Management Institute; private communication, 1982.
3. Holm, Phillip, "Ownership and Tax Considerations," Proceedings of Resource Recovery Financing Conference, U.S. Conference of Mayors, Washington, DC, March 1982.
4. Klepper, Martin, Sherman, Joseph and Megan, Carroll; Innovative Financing for Energy Efficiency Improvements: Phase I Report, Lane & Edson, P.C., 1800 M Street, N.W., Washington, DC, p. 153, 1982.
5. Klepper, Martin and Sherman, Joseph and Megan, Carroll; "Improving Local Government Fiscal Management," (Chambers of Commerce of the United States), 1615 H Street, N.W., Washington, DC, 20062, p. 41, 1981.
6. Maddocks, Henry E., Account Executive, Alexander & Alexander, Inc., Shelard Plaza, P.O. Box 1360, Minneapolis, MN 55440; private communication, 1982.
7. Deans, Bob, "Firm Introduces Insurance for Safe Harbor Deals," Energy User News, August 1982
8. Horvath, Joseph J., President, Joseph J. Horvath Co., 967 Farmington Avenue, P.O. Box 89, West Hartford, CT 06107; private communication, 1982.
9. Dayton, David, President, Technical Development Corporation, 11 Beacon Street, Boston, MA 02108; private communication, 1982.
10. Krochalis, op. cit.
11. Brown, Barry, U.S. Department of Energy, Federal and Community Programs Division, 1000 Independence Avenue, Washington, DC 20585; private communication, 1982.

12. Krochalis, op. cit.
13. U.S. General Accounting Office, "Millions Can be Saved through Better Energy Management in Federal Hospitals," (HRD-82-77), Gaithersburg, MD 20760; 1982.

4. CRITICAL CONTRACTING ISSUES

INTRODUCTION

Beginning with the work effort in Phase I, three critical issues must be addressed in establishing the contract format, the solicitation wording, the evaluation methods, and the necessary administrative and accounting procedures. Several of these issues will continue to be of concern throughout the entire pilot study.

We will consider them in the following order:

- Precedents and Authority for Shared Savings Contracts
- Baseline Determination and Energy Consumption Accounting
- Contractor Qualifications

PRECEDENTS AND AUTHORITY FOR SHARED SAVINGS CONTRACTS

Multi-Year Contracting

In the DoD Authorization Bill (P.L. 97-869) of FY 1982, Congress gave approval for multi-year procurement of goods and services within the continental United States. The Bill permits such contracts to be financed by funds made available for each single year of the contract. The contract may have a term of more than one but not more than five program years. The renewal of the contract during the second through the fifth year may be contingent upon the appropriation of funds. Funds for potential termination charges--i.e., contractor cost recovery--must be appropriated in both the initial and subsequent years.

Although this law was written to achieve economic, lot purchase and the more efficient production of weapon systems, contracts for operations and maintenance and energy maintenance services are also authorized contingent

upon appropriated funds. Specifically exempted from multi-year contracting authority, however, are contracts for the construction, alteration, major repair, or improvement of real property. This exemption, unfortunately, would limit shared-savings contracts to quick payback¹ items since real property (boilers, chillers, building envelope) could not be involved in multi-year contracts. Since these real property items are long payback, expensive investments, probably no contractor would be willing or able to finance such projects without multi-year authority. This policy by Congress may eliminate one of the real benefits of shared-savings contracting -- off-budget financing of expensive ECIP projects.

Some shared savings contractors offer energy services under a contract to provide "thermal comfort." This may be considered as essentially a utilities service contract. According to Defense Acquisition Regulations (DAR),² when a solicitation of utilities service suppliers (in this case, shared-savings contractors) indicates that an award to a supplier already under contract is in the best interest of the Government, those services may be obtained by a change order modification to the existing contract. Utilities service contracts may also provide for positive action to renew them annually. Therefore, utilities service contracts may continue in effect until further notice or until terminated, without positive action being required to renew its terms.

It appears, therefore, that utility services contracts are usable for the "purchase" of thermal comfort from shared-savings contractors in a multi-year contract and would not necessarily be limited to five years.

The Codification Act of 1982 further modified the ability to award multi-year procurements by allowing 30 year contracts for geothermal and refuse derived fuel generating plants. The proposed DoD Authorization Act of

1983 is expected to include 30 year contract authority for any conservation or energy contract. Obviously, this will eliminate the roadblocks against multi-year contracting authority.

Precedents for Shared-Savings Contracts

A precedent for shared-savings contracts exists in the DAR and in the Federal Acquisition Regulation (FAR) under the Value Engineering (VE) sections. As defined in the DAR:³

"Value Engineering is the formal method set forth in an appropriate contract clause by which, during the performance of a contract, the contractor may suggest methods for performing the contract more economically and share in any resulting savings or may be required to establish an organization aimed at identifying and submitting to the Government methods for performing the contract more economically."

As defined above, there are two VE programs, a voluntary program by the contractor and a mandatory program imposed upon the contractor by the Government, both of which allow the contractor to share in the savings realized. These clauses are mandatory for all architect-engineer contracts, all construction contracts over \$100,000, and in personal services contracts; all of which are implicit in energy management contracts.*

VE allows two types of savings to be shared: acquisition and collateral savings. Acquisition savings apply to contracts for supplies or services; collateral savings apply to measurable net reductions in the Military Departments overall projected cost of operation, maintenance, logistic support, or government-furnished property, whether or not there is any change in the acquisition cost. Acquisition and collateral savings are further subdivided into instant, concurrent, or future contract savings.

* Mandatory VE Program Requirement Clauses in A/E contracts do not include VE sharing provisions.

The typical shared savings contract savings may be considered under either of two classifications of VE savings: (a) acquisition savings for purchases of new supplies (e.g., a new, more efficient boiler nozzle replacement); and (b) the collateral savings resulting from improved O&M. The collateral savings are the savings that would be realized during an average or typical year, except that the contractor's share shall not exceed the price of the contract or \$100,000, whichever is greater. The DAR gives clear savings split ratios for each of these conditions depending upon the type of contract, as shown in Table 4-1.

TABLE 4-1. SHARING RATIOS

<u>Type of Savings</u>	<u>Type of Contract</u>	<u>VE Incentive Clause (Voluntary Program)</u>	<u>VE Program Requirement Clause (Mandatory Program)</u>
Acquisition	Fixed-Price (other than incentive)	50/50	75/25
	Fixed-Price Incentive or Cost-Plus- Incentive Fee	65/35	80/20
	Cost-Plus-Award- Fee	75/25	85/15
	Cost Reimbursement	75/25	85/15
Collateral	All Types	80/20	80/20

The sharing ratios may be modified in incentive contracts to be the same incentive ratio as in the contract. The sharing period is from the date of acceptance of the first item acquired under the VE clause until the delivery date of the last affected end item, or three years after acceptance of the first item, whichever is later. In a shared-savings contract, the "item" provided would be "services."

In multi-year contracts, the initial fiscal year VE savings are instant contract savings and all subsequent year savings are treated as future contract savings. The sharing period is the entire life of the multi-year contract or three years, whichever is longer.

Several conditions and tests must be met for proper documentation and classification of the contractor's savings. In summary, it appears (without a detailed ruling by counsel) that a fixed price shared-savings contract for \$1 (or some minimal value) could be awarded and yearly VE submittals be made (with monthly prepayments) to provide the contractor's 50% split of the avoided utility costs. Otherwise, a straight incentive contract may be written to incorporate the split ratio directly.

Finally, as previously mentioned in the multi-year contracting section, certain types of utilities service contracts for purchase of "thermal comfort" may be utilized to award shared-savings contracts, usually in the form of open-ended contracts.

OMB Circular A-76

The complexities of OMB Circular A-76 will not be discussed here other than to indicate that the same cost comparison analysis must be performed for shared savings contract awards as for other Commercial Activities.⁴

Real Property Acquisition by Shared Savings Contracting

One of the key policy issues that must be resolved is whether shared savings contracts will usurp the "overseer" power of Congress for military construction and real property acquisition. Presently each ECIP project must be individually approved by Congress. However, a shared-savings contractor will wish to install real property equipment and, in fact, will base his bid on the assumption that he can install it. If installation is contingent upon a lengthy Congressional approval or if lengthy life cycle cost calculations

must be made to justify projects, many shared-savings contractors will prefer not to bid for government work.

DoD counsel should request an official ruling from OMB, Congressional, and GSA counsel on the status of capital equipment acquisition with shared savings contracts.

Tax Revenue Losses

There have been many cash-flow analyses presented in the literature indicating that because of tax credits and depreciation the discounted net present value of savings to a non-profit institution is greater with shared savings contracts than with in-house financing or loan financing. This is particularly true for projects having longer than about 2-year simple undiscounted paybacks.^{5,6,7} What has not been thoroughly considered is the situation in which the non-profit institution is the federal government. In this case, the contract may result in tax benefits (tax credits and depreciation) for the profit making company, a set of limited partners, or the equipment lessor, resulting in a loss of tax revenues to the client, the federal government. Many of these credits are expiring shortly, and the impact of lost tax revenue will likely be minimal. In addition, our research indicates that tax credits are not a major factor in most shared savings contracts. However, it will be important that the work in Phase I of the Pilot Study insure that the pilot projects not result in a net tax loss to the Treasury. Beyond that, the decision to extend or expand the use of shared savings contracts should be informed by work in Phase III to address the long-term effect of such contracts on Treasury revenues.

BASLINE DETERMINATION AND ENERGY ACCOUNTING METHODS

There are two measurement tasks at issue: determining the baseline of energy consumption (the "before"); and keeping an accurate track of the actual energy avoidance as result of the contract (the "after").

The determination of the base year consumption level and the method of computing the energy savings attributable to the efforts of a contractor are a most crucial part of the shared-savings contract negotiation. Proper accounting for variations in consumption caused by changes in degree-days, square footage used, occupancy schedules, solar gain, wind, and other factors is important to the success of a shared savings contract.

The baseline determination, although obviously linked to energy accounting methods, is generally easier. A shared savings contractor will usually offer his clients several methods of determining the baseline, ranging from a simple average of fuel consumption over time (which works well for "stable" buildings where the accounting variables mentioned above are presumed to be constant over time) to sophisticated multiple linear regression analyses, and including so-called "dual baseline" methods. In this section we discuss the two methods presently available for baseline determination and energy accounting, namely, metering and regression analysis.

Metering

At most DoD installations there are few sub-master metered buildings, and there are no current plans to provide this level of individual building metering. One obvious solution to this problem is to have the shared savings energy management company install individual meters on buildings included in the contract specifications. However, before the project contract can be bid and awarded, some historical consumption data must be available for a baseline determination for the prospective building(s).

The DoD should begin to determine a number of "contractable sectors" at its major installations. For example, several buildings on isolated utility distribution systems could be measured aggregately by one or more meters for each energy source. Since consumption data for one or two years

are desirable for a good baseline, these buildings could not be sites for a pilot project, but could take part in subsequent contracts.

DoD has always had an energy management problem in the lack of individual building metering. This has precluded, for example, breaking out energy consumption by building category or building type. In particular, differentiation between "process" and "thermal comfort" energy consumption is not possible at the installation or building level. Additionally, even when utility bills or meter readings are available, they are often not available in a timely fashion. There are times when the consumption in one period is not reported until the next period, causing skewed monthly data.⁸

Within DoD, sub-master individual metering has been or is available only in a few instances:

- (1) 19,279 meters were installed and monitored in a feasibility test of 10,316 family housing units at ten U.S. military installations, in response to Public Law 95-82 (August 1977). Meters in the test included those which measured electricity, natural gas, fuel oil, and steam consumption. The Report to Congress⁹ on the test, dated 1 March 1980, included the following summary:

"While the program of metering with norm and penalties will doubtlessly produce energy savings, they will be rather small and the direct cost of achieving those savings would be very high. Additionally, accompanying adverse personnel reaction would make that cost even higher,.... On the other hand, other programs based on education and facility improvements can guarantee a greater potential energy savings with no negative personnel reaction or adverse morale impact. Based on this study these alternatives appear to offer very attractive means of conserving energy within DoD family housing."

Congress has rejected the DoD report conclusion but has taken no further action. Proponents of metering have

criticized faults of the methods used in the test and argued that these faults compromise the test's validity. Those who have argued against metering consider their point of view vindicated by the report. As a result, many concerned managers still do not know if metering is cost effective in general, or under what circumstances it might be. Consequently, no further metering of family housing units has been proposed, except for installation of meters in new single family units and meter drops in new multifamily housing.

- (2) For commercial and industrial type buildings within DoD, much of the same confusion has occurred as in family housing. Since there is no incentive at the building operator level (i.e., energy cost avoidances are not returned to the conserving organization), there has been no push to meter these buildings either.
- (3) In the case of tenant commands on a host command installation where utilities are chargeable, some meters have been installed to provide billing information. Often, however, this billing is prorated by square-footage.
- (4) Various installations, on their own initiative, have installed metering projects, sometimes in conjunction with an EMCS computerized system (e.g., Langley AFB, Wright-Patterson AFB, Norfolk Navy Base, and San Diego Navy Base).

Regression Analysis

Although metering consumption data is the ideal baseline determination method, it is not required for most shared savings contracts. Instead,

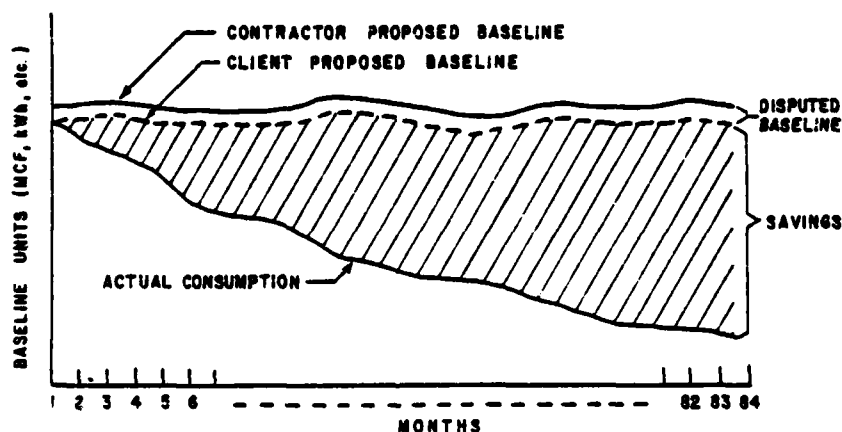
multiple linear regression analysis is frequently used to determine a baseline consumption for each month of the contract term. This baseline is calculated on selected predictor variables such as degree days, production units or occupancy schedule. Various combinations of utility data sampling and engineering estimates (e.g., BLAST space condition models) are used to provide short time-series consumption data, which are then analyzed with similar time-series data on the predictor variables to obtain a baseline formula. This formula determines the predicted monthly baseline consumption as a function of the most significant predictor variables. Once the formula has been determined and agreed to by both parties, only the predictor variables need measuring to define the baseline during the term of the contract.

To measure the contractor's performance (i.e., energy savings), meters should be installed (by the contractor) and data then compared to the regression derived baseline. If, instead, engineering estimates are used to determine the contractor's savings, the client must place a great deal of confidence in the shared savings contractor -- an arrangement that may not be satisfactory for either party.

Most shared savings contractors are not especially concerned about the method of baseline determination, accepting any reasonable baseline that the client or his consultant determines as fair. The reason for this is obvious from Figure 4-1, over a seven- to ten-year contract term, any disputed savings would not be a significant fraction of total savings. The regression derived baseline will automatically restate the monthly baseline for changes in the significant predictor variables. For other baselines (those derived from metering actual consumption or estimating average consumption), provisions must be made to restate the monthly baseline during the contract term for changes in such variables as building capacity, production, weather, or

conservation efforts by client. Normally, the original baseline is renegotiated if either party feels there has been a significant (e.g., over 10%) change in the baseline consumption due to any of these variables. As a minimum requirement, degree day, square footage, and production or service capacity adjustment formulas should be negotiated into the original agreement. One of the most successful baselines in current use is a regression equation of production variables (Btu/production unit) which is modified for degree days. It requires only accounting of the production units and degree days to determine the baseline for each month during the contract term. A method is available for determining baseload, space comfort load, production load, and overrun in each of these loads from master meter consumption data.¹⁰

FIGURE 4-1. BASELINE SENSITIVITY OVER TERM OF CONTRACT



In general, the shared savings contractor will pass along to the client non-energy related savings such as those resulting from reduced maintenance or increased equipment life. The original negotiation should clearly spell out how such savings are to be accounted for and to whose benefit.

Also, most contracts contain a capacity utilization clause which allows the use of a different split of the savings for the contractor's fee if

the building falls below some minimum utilization level. This may be set at 10 percent below the baseline, for example, and be modified in the same way as the baseline.

Certain very expensive pieces of equipment or additional peripheral equipment (such as security or fire alarm functions in an EMCS) may be partially paid for by client but installed by the shared savings contractor for a flat fee per year. The energy savings, if any, due to this equipment must be estimated or metered and adjusted out of the baseline and actual consumption data.

Finally, when a contract is negotiated, various projections for fuel price escalation are usually delineated in the contract, and the current utility rate schedule is specified. If a windfall might occur to the contractor due to an unexpected rise in fuel price, the contract could include a circuit breaker clause. That precludes the contractor from including in his billing that portion of dollar savings due to prices in excess of 10 percent of the previously negotiated projected fuel price escalation.

The development of an acceptable and prudent method or combination of methods for energy accounting is the critical technical task in Phase I. Shared savings contracts are potential "change order" contracts. Without adequate energy accounting, DoD contract administrators may be overwhelmed with claims, both legitimate and otherwise.

CONTRACTOR QUALIFICATIONS

All shared savings contractors do not offer the same high level of qualified energy engineers and technicians. The most recent example of this is the poor quality of engineering services associated with Technical Assistance (TA) applications filed by institutions with the DOE Institutional Conservation Program (ICP).¹¹ A real problem was found with service quality in the ICP.

This problem occurred with consulting engineering firms as well as with engineers associated with nonconsulting firms or operating independently.¹²

Within DoD, A&E consulting firms characteristically perform most design work for new construction. There are many indications that these firms are not providing state-of-the-art energy measures in their designs. Many of the energy management services companies are much better at implementing energy conservation measures. These energy service companies usually have qualified energy engineers on staff able to perform the necessary technical analysis of retrofits. It should be remembered that in the ICP/TA audits, the engineer usually did not implement the recommendations, but only provided them. In energy service companies, the engineer implements his own recommendations and, since his income is derived from savings not consulting fees, his recommendations are likely to be more realistic and thorough.

If shared savings is implemented within DoD, several problems may arise, that may not show up evident in a pilot project. In a full-scale implementation, the demand for shared savings contractors by DoD may greatly exceed the small number of qualified contractors with "track records" presently in the business. Also, DoD may be required to some extent, in its procurement process, to use or favor small business contractors, many of whom may lack the professional skills and financial stability needed. Since these contracts may extend over 5-10 years, DoD will be forced to live with "procurement errors" for some time.

Although problems specific to DoD seem large, the private sector has successfully surmounted most of these same problems already. Use of a two-step procurement process, with award based on contractor qualification, is integral to much of the present success in the private sector. Private sector administrators have the luxury of not having to choose the low bid; they can

eliminate contractors that are not qualified. Rigid DoD procurement regulations often preclude this capability. However, the two-step procurement we have discussed in this report appears to be the only reasonable way to procure these services (it is similar to the competitive negotiation for A&E contracts). The use of this process appears to be compatible with the type of contracting, but we must emphasize that contractor qualification is crucial.

The solution is uniform "pre-negotiation" qualification standards for energy engineers and technicians. There is already in existence a successful Certified Energy Manager (CEM) program for energy engineers, sponsored by a professional society, the Association of Energy Engineers (AEE). The program is very successful (many DoD engineers have been certified) and is accepted by the industry as certifying the "minimum qualifications" for an energy engineer. DoD should require that all energy engineering design retrofit or technical analysis work be provided by a CEM. This will include all work performed by engineers for the shared savings contractor.

AEE has been contacted and has offered to provide DoD-specific certification (for example, regular CEM plus a test on DoD EMCS specifications, life cycle costing methods, and change order justification) for energy managers. We feel that DoD should avail itself of this opportunity to assure that all potential contractors are at least minimally qualified.

It is unfortunate that there is no certification program for energy technicians, most of whom are electrical or HVAC contractors installing the energy equipment and retrofits. A minimum level of technician quality is vitally important for installation and maintenance of equipment that will eventually become government property. Recently, it was reported that an EMCS certification program was being implemented. AEE is willing to work with a contractors' association or society to help set up a Certified Energy Technician

(CET) program. DoD should encourage these groups to set up certification programs and include DoD-specific certification tests in the program. If and when such a program is established, a shared savings contractor should be required to employ CEM's and CET's in order to be a "qualified Government contractor."

REFERENCES

1. 10 USC 2306 Section H, March 1982.
2. DAR Supplement No. 5.
3. DAR, Part 17, 1-1701.1.
4. DoD Directive 4100.15, "Commercial and Industrial Type Activities," February 4, 1980.
5. Esteves, R. M., "Evaluating Conservation Financing Alternatives for Non-Profit Buildings," General Public Utilities, Parsippany, NJ, 1982.
6. Department of Housing and Urban Development, "An Analysis of the Feasibility of Energy Management Companies in Public Housing and Section 202 Housing," Division of Building Technology, Office of Policy Development and Research, Washington, DC, 1982.
7. Brown, D. L. and Rauch, Robert J., "Energy Investment: Comparing Financial Alternatives in Tough Times," November/December 1982, Energy Management, Cleveland, OH.
8. Federal Energy Management Program Office, "Identification of Viable Alternatives for the Attainment of Better Energy Consumption Data in the Federal Building Inventory," Department of Energy, Washington, DC, December 1980.
9. Office of the Deputy Assistant Secretary of Defense (Installations and Housing), "Family Housing Metering Test," Report to Congress, March 1980.
10. Fite, R.E., "Energy-Use Documentation," Proceedings of 8th Energy Technology Conference and Exposition, Washington, DC, March 1981.
11. The Synectics Group, "Institutional Conservation Program Evaluation: An Interim Report," Washington, DC, October 1982.
12. Guzzi, L. et al., "Quality of Engineering Service: Energy Conservation Projects Under DOE Schools and Hospitals Grants Program," Professional Engineers in Private Practice, Washington, DC, March 1982.

APPENDIX A

BIBLIOGRAPHY

ECONOMIC POLICY

Choate, P. and Walter, S., America in Ruins, Council of State Planning Agencies, Washington, D. C., 1981.

Brimmer, D. and Sinai, A., Tax Policy and Business, Data Resources, Inc., Cambridge, Massachusetts, 1981.

Shapiro and White, Capital for Productivity and Jobs, American Assembly, Columbia University, New York City, 1980.

The Economist, "How to Privatize Public Investment," London, United Kingdom, December 5, 1980.

BUSINESS AND INDUSTRY

Rakowski, Richard, "CEO's Confess: U.S. Industry Is Not Managing Energy," Energy User News, March 1, 1982.

Deans, Robert, "Consulting Services Could Save Firm \$1M," Energy User News, April 5, 1982.

Marketing Documents, Corporate Energy Management, Inc., Richmond, Virginia, 1982.

"Proposal for Preparation of Model Procedures for the Procurement of Energy Services by Federal Agencies" submitted to the U.S. Department of Energy by the Joint Venture of Haufler, Inc. and Heery Energy Consultants, Inc., April 1982.

FINANCING ENERGY PROJECTS

"The Impact of the Economic Recovery Tax Act of 1981 on the Renewable Energy Industry," Renewable Energy Institute, Washington, D. C., 1982.

Apcar, Leonard M., "More Leasing Expected Despite Repeal," Wall Street Journal, September 4, 1982.

Betts, Mitch, "Big Tax Credits Spur Energy Projects: Survey," Energy User News, September 13, 1982.

Esteves, R. M., "Evaluating Conservation Financing Alternatives for Non-Profit Buildings," General Public Utilities, Parsippany, New Jersey, June 1982.

Ritler, Henry D. and Smith, James H., "Leasing Under the Economic Recovery Act of 1982," National Alliance for Hydroelectric Energy, Washington, D. C., 1981.

Maturi, Richard, "Shared Savings Financing of Energy Conservation Projects," Blue Cross/Blue Shield Association, Chicago, Illinois, 1981.

Smukler, Larry M. et al, "The Financing of Private Small Scale Hydroelectric Projects," U.S. Department of Energy (DOE/CE/04934-44), March 1981.

GOVERNMENT TOPICS

Topinka, John P., "Integrating Energy: A Fiscal and Resource Management Strategy for Local Government," National Association of Counties, Washington, D. C., 1982.

"GSA Could Do More to Improve Energy Conservation in New Federal Buildings," U.S. General Accounting Office (GAO/PLRD-82-90), Washington, D. C., 1982.

MacLean, John C., "State Policy Initiatives for Financing Energy Efficiency in Public Buildings," College and University Energy Management and Financing Program, Washington, D. C., 1982.

Steil, Kenneth M. and Steinthal, Bruce G., "Non-Standard Procurement," Public Technology, Inc., Washington, D. C., 1980.

DEPARTMENT OF DEFENSE TOPICS

Anderson, Jack, "Inquiry Faults Pentagon on Energy Saving," Washington Post, October 27, 1982.

Bureau of Medicine and Survey Instruction 4100.2A, "Management of Energy Resources," June 11, 1982.

Office of Deputy Assistant Secretary of Defense (Energy, Environment and Safety) Department of Defense Energy Management Plan, Washington, D. C., 1981.

U.S. Navy Energy Office, Energy Plan FY 1982, Navy Department, Washington, D. C., 1981.

Department of Defense Directive 7250.5, "Reprogramming of Appropriated Funds," January 9, 1980.

Department of Defense Instruction 7041.3, "Economic Analysis and Program Evaluation for Resource Management," October 17, 1972.

BUILDING ENERGY EFFICIENCY

D. C. Solar Task Force, "Thirty Five Steps - Making Conservation and Solar Work in the District of Columbia," Washington, D. C., 1982.

National Institute of Building Sciences, "Building Energy Efficiency Project," Washington, D. C., 1982.

Office of Technology Assessment, Energy Efficiency of Buildings in Cities, Washington, D. C., 1982.

Kaye, Steven, ed., MultiFamily Energy Conservation, Coalition of Northeast Municipalities, Boston, Massachusetts, 1981.

New Mexico Energy and Minerals Department, "Total Effective Energy Management," Sante Fe, New Mexico, 1978.

National Science Teachers Association, "Energy Conservation: Homes and Buildings," U.S. Department of Energy (HCP/U 3841-12), Washington, D. C., 1976.

HOSPITALS AND ENERGY

"Energy Impacts on the Health Care System," U.S. Department of Health and Human Services, Public Health Service (HRA 81-14514), Hyattsville, Maryland, 1981.

Conference Report "Developing an Action Program for Energy and Economic Contingencies Affecting Health Services Delivery," Bureau of Health Facilities, Health Resources Administration, Public Health Service, Hyattsville, Maryland, 1980.

"Energy Issues in Health," United States Department of Health, Education and Welfare, Public Health Service - Health Resources Administration (HRA 79-14510), Washington, D. C., 1979.

"National Symposium on Hospital Energy Management," sponsored by the American Hospital Association and the U.S. Department of Energy, 1982.

APPENDIX B

LIST OF ENERGY SERVICE SUPPLIERS

Table B-1 on the following pages is a comprehensive list of firms in the U.S. currently providing energy services. Those identified with an asterisk (*) responded to advertisements placed by LMI in September 1982 editions of the Energy User News soliciting names of firms interested in shared savings contracting with the DoD.

TABLE B-1. ENERGY SERVICE SUPPLIERS

AABS Energy Management Co.
(AABS Electric Co.)
4338 W. Montrose Avenue
Chicago, IL 60641

ACR Energy Concepts Inc.
1704-A Manor Road
Austin, TX 78722

Acurex Corporation
Energy & Environmental Division
485 Clyde Avenue
Mountain View, CA 94042

Henry Adams, Inc.
401 Washington Avenue
P.O. Box 10657
Baltimore, MD 21204

Adams Industrial Sales Inc.
833 Ashmore Drive
Charlotte, NC 28212

*ADT
One World Trade Center
92nd Floor
New York, NY 10048

Advanced Electronic Controls
of Virginia
P. O. Box 11824
7 Pinehaven Drive
Lynchburg, VA 24506

Advanced Energy Applications Inc.
1386 Holt Avenue
Los Altos, CA 94022

Advanced Energy Concepts Division
Mangold Industrial Systems Co.
5032 N. Hollywood Avenue
Milwaukee, WI 53217

Advanced Energy Concepts International
(Energy Engineering)
50 Bardonia Road
Bardonia, NY 10954

Advanced Roof-Energy Systems Inc.
Champion Tower
400 E. Anderson Lane, Suite 460
Austin, TX 75752

Aegis Energy Systems, Inc.
607 Airport Blvd.
Doylestown, PA 18901

Aerospace Systems Inc. (ASI)
Energy Systems Division
121 Middlesex Turnpike
Burlington, MA 01803

A.G.F. Corporation
23-41 Borden Avenue
Long Island City, NY 11101

The A.I.M. Collaborative
2969 Route 23
Newfoundland, NJ 07435

Aircon Energy Inc.
4887 Pasadena Ave.
Sacto, CA 95841

Aircon Service, Inc.
4887 Pasadena Avenue
Sacramento, CA 95841

Aire-Rite A/C & Refrigeration, Inc.
5331 Production Drive
Huntington Beach, CA 92649

Eliot Allen & Associates Inc.
5006 Commercial Street, SE
Salem, OR 97306

Allen & Hoshall Inc.
2430 Poplar Avenue
P.O. Box 12788
Memphis, TN 38112

Alltek Energy System
P.O. Box 116
Waterford, NY 12188

Alta Consulting Services Inc. (ACSI)
530 Lytton Avenue
Palo Alto, CA 94301

Alternate Energy Institute, Inc.
17200 Pearl Road
Strongsville, OH 44136

Althoff Industries, Inc.
809 N. Front Street
McHenry, IL 60050

American Energy Consultants
8444 Melba Avenue
Canoga Park, CA 91304

American Energy Products Inc.
2800 South Court
Palo Alto, CA 94306

American Energy Savings Inc.
Division of Val Corp.
8956 Tampa Avenue
Northridge, CA 91324

American Lodging Systems, Inc.
6185 S. Buford Highway
Suite C-152
Norcross, GA 30071

American Stream Inc.
P.O. Box 1916
Plano, TX 75074

*Amherst Telemetry & Controls Corp.
Northwood Executive Park
10 Northern Boulevard
Amherst, NH 03031

*Amortec Corp.
707 East 65th Street
P.O. Box 20068
Indianapolis, IN 46220

Amtch Energy Services
(Amer. Bldg. Maint. Ind.)
1266 Fourteenth Street
Oakland, CA 94607

Amtch Lighting Services
(American Tech. Service Co.)
921 E. 61st Street
Los Angeles, CA 90001

Anderson Energy Associates Inc.
5212 Echo Pines Circle E.
Fort Pierce, FL 33450

Applied Energy Systems, Inc.
Suite 614
1980 N. Atlantic Avenue
Cocoa Beach, FL 32931

Applied Forecasting
167 S. San Antonio Road
Los Altos, CA 94022

Applied Technology Division
(E.I. du Pont de Nemours & Co. Inc.)
Barley Mill Place
Wilmington, DE 19898

Appropriate Technology Associates, Inc.
414 E. Pokagon
South Bend, IN 46617

Arce & Hendrix Engineers Inc.
P.O. Box 2447
Greenville, SC 29602

ARIIX Engineers Architects Planners
2021 Clubhouse Drive
Greeley, CO 80631

Armsby Engineering Inc.
797 Washington Street
Newtonville, MA 02160

Associated Data Consultants
7100 Camino Real
Boca Raton, FL 33433

Associated Energy Consultants, Inc.
7100 Camino Real
Boca Raton, FL 33433

Associated Energy Consultants, Inc.
P.O. Box 387
Northampton, MA 01061

Associated Engineers Inc.
1728 Central Avenue
Fort Dodge, IA 50501

Associated Funders Corp.
331 Washington Avenue
Marietta, GA 30060

Associated Planning and
Development Services, Inc.
Brooks Bldg. 604
Scranton, PA 18503

Assured Energy Management Inc.
230 W. Main
Manchester, IA 52057

Table B-1 (Continued)

Atlanta Power Technology Co.
175 W. Wieuca Road, N.E.
Suite 210
Atlanta, GA 30342

Automated Energy Management
P.O. Box 10326
Corpus Christi, TX 78410

Automated Energy Management Systems
37 Manalapan Avenue
Freehold, NJ 07728

*Automatic Energy Control Co. (AEC)
12 White Oak Road
Landenberg, PA 19350

Automation Control Services
503 Faye Lane
Redondo Beach, CA 90277

Automation Supervision, Inc.
92 Cedar Street
Lexington, MA 02173

Ayres Associates
1180 South Beverly Drive
Suite 600
Los Angeles, CA 90035

Owen Ayres & Associates, Inc.
1300 West Clairmont Avenue
P.O. Box 1590
Eau Claire, WI 54702

*BSA Engineers, Ltd.
18 South Michigan Avenue
Chicago, IL 60603

Michael Baker, Jr.
of New York, Inc.
Michael Baker Corp.
205 E. 42nd Street
New York, NY 10018

Bakke Kopp Ballou McFarlin, Inc.
219 N. 2nd Street
Minneapolis, MN 55401

Ballinger
841 Chestnut Street
Philadelphia, PA 19107

Baltes & Associates, LTD.
5151 North 16th Street, D212
Phoenix, AZ 85016

Balzhiser/Hubbard & Associates
860 McKinley Street
Eugene, OR 97402

Banner Associates Inc.
620 Plaza Court
Laramie, WY 82070

Barbay Engineers, Inc.
6942 Titlan Avenue
P.O. Box 66424
Baton Rouge, LA 70896

Barber-Colman Company
Environmental Controls Division
1300 Rock Street
Rockford, IL 61101

Bardige Energy Associates Inc.
57 Old Country Road
Westbury, NY 11590

Simmons J. Barry &
Associates, Inc.
P.O. Box 1751
Baton Rouge, LA 70821

Theodore Barry & Associates
1520 Wilshire Blvd.
Los Angeles, CA 90017

Batlan & Ozman, P.C.
500 Eighth Avenue
New York, NY 10018

Battelle Columbus Division
Battelle Memorial Institute
505 King Avenue
Columbus, OH 43201

Battelle Pacific Northwest
Laboratories
Battelle Memorial Institute
P.O. Box 999
Richland, WA 99352

BBC Energy Management Inc.
316 Park Crest Drive
Freeport, IL 61032

Beard-Wiel Associates
1063 15th Street
Sparks, NV 89431

R. W. Beck & Associates
Tower Building
7th Avenue at Olive Way
Seattle, WA 98101

*Benatech, Inc.
100 Noble Ridge Drive
Atlanta, GA 30338

Benec Industries Inc.
300 Park Avenue South
New York, NY 10010

The Benham Group
1200 N.W. 63rd Street
P.O. Box 20400
Oklahoma City, OK 73156

Berger Associates
101 Erford Road
Camp Hill, PA 17011

Raymond C. Bergeron & Associates Ltd.
3636 North Causeway Blvd.
Suite 106
Metairie, LA 70002

Bergoust Engineers & Company, Inc.
228 W. Main
Missoula, MT 59801

Berkeley Solar Group
3140 Grove Street
Berkeley, CA 94703

Ralph H. Bernstein/Consultant
116 W. Peach Orchard Road
Dayton, OH 45419

R.V. Bethel & Associates, Inc.
316-C S. Chase Avenue
Columbus, OH 43204

Betz-Converse-Murdoch Inc.
One Plymouth Meeting Mall
Plymouth Meeting, PA 19462

BHCD Engineers, Inc.
1433 17th Street
P.O. Box 5237
Denver, CO 80202

The Bickle Group
Division of CRS Groups Inc.
1177 West Coop South S. 240
Houston, TX 77027

George Birman
P.E. Consulting Engineer
422 E. 58th Street
New York, NY 10022

Bogen Johnston Lau & Jenal, P.C.
983 Willis Avenue
Albertson, NY 11507

*Boidyreff, Crosby & Forgiel, Inc.
110 E. Huron Boulevard
Marysville, MI 48040

*A. Bontempo
1623 S. Fernandez Avenue
Arlington Heights, IL 60005

Booz-Allen & Hamilton Inc.
(Energy & Environment Division)
4330 East West Highway
Bethesda, MD 20814

Booz-Allen & Hamilton Inc.
Energy & Environment Division
4550 Montgomery Avenue
Suite 1000N
Bethesda, MD 20014

Boyle Engineering Corp.
1501 Quail Street
Newport Beach, CA 92660

Kendall H. Breedlove & Associates
6129 Leesburg Pike
Suite 714
Falls Church, VA 22041

Brothers Energy Resources, Inc.
5141 Oakman Blvd.
Dearborn, MI 48126

Brown & Caldwell
1501 N. Broadway
Walnut Creek, CA 94596

Table B-1 (Continued)

Brown Engineering Co.
1001 Office Park Road
West Des Moines, IA 50265

Brown Vance & Associates
124 Spear Street
San Francisco, CA 94105

Buitendorp Associates, Inc.
86 E Sixth Street
Holland, MI 49423

Burke Energy Controls Co., Inc.
(BECCO)
1727 Francis Drive
Anaheim, CA 92801

Robert G. Burkhardt
& Associates, Inc.
407 South Dearborn
Suite 275
Chicago, IL 60605

Burns and Roe Industrial
Service Corp.
650 Winters Avenue
Paramus, NJ 07652

Griffith C. Burr, Inc.
139 Scott Street
Memphis, TN 38112

Burt Hill Koser Rittelmann
400 Morgan Center
Butler, PA 16001

Bywaters & Associates
P.O. Box 25111
Dallas, TX 75225

*California Power Management, Inc.
8404 Pershing Drive
Playa Del Rey, CA 90291

California Energy Management
641 35th Street
Sacramento, CA 95816

Camargo Associates Limited
P.O. Box 41386
Cincinnati, OH 45241

Camp & Associates
120 Copeland Road
Suite 243
Atlanta, GA 30342

Cannon Design Inc.
(The Cannon Group)
2170 Whitehaven Road
Grand Island, NY 14072

Can-Pac Energy Consultants
9026 Glover Road
P.O. Box 579
Fort Langley, B.C.
VOX 1J0, CANADA

Can-Pac Energy Consultants LTD.
Suite 216
17704 56th Avenue
Surrey BC, CANADA VOX1J0

J. J. Capo, P.E.
360 Lexington Avenue
New York, NY 10017

*Capsul-Aire Service Company
P.O. Box 382
Ridley Park, PA 19078

Carlson & Sweatt-Monaco Inc.
Two Pennsylvania Plaza
New York, NY 10121

Carolina Energy Control Systems
P.O. Box 1569
Brevard, NC 28712

Carter Engineering, Inc.
1107 Spring Street
Silver Spring, MD 20910

Cashin Associates, P.C.
499 Jericho Turnpike
Mineola, NY 11501

Cataudella Associates Inc.
221 Waterman Street
Providence, RI 02906

C. E. Electric
613 Pickwick Court
Mt. Prospect, IL 60056

Centaurus Software Inc.
975 Hornblend
Suite B
San Diego, CA 92109

C & H Constructors Inc.
Route 18, Box 692
Brownlee Road
Birmingham, AL 35210

CH2M Hill
200 S.W. Market Street
Portland, OR 97201

Cheek Engineering Company
1706 Ivie Lee
Baytown, TX 77520

CII Engineered Systems Inc.
P.O. Box 13199
6767 Forest Hill Avenue
Richmond, VA 23225

The Clark Enersen Partners
600 NBC Center
Lincoln, NE 68508

Sherman H. Clark Associates
1100 Alma Street
Suite 100
Menlo Park, CA 94025

The Cody Company, Inc.
1168 Waimanu Street
Honolulu, HI 96814

Cogeneration Development Corp.
350 Fifth Avenue
Suite 1134
New York, NY 10118

Cogenic Energy Systems, Inc.
645 Fifth Avenue
New York, NY 10022

Donald A. Coggan
Consulting Engineer
433 Place Jacques Cartier
Montreal, Quebec H2Y 3B1, CANADA

Colt Energy Management Inc.
7525 Mission Gorge Road
San Diego, CA 92120

Combustioneer Energy Management Corp.
818 18th Street, N.W.
Washington, DC 20006

*Comfort Air Systems Inc.
95 Eames Street
Framingham, MA 01701

Commonwealth Energy Group Ltd.
200 Swanton Street
Suite T-12
Winchester, MA 01890

Computerized Energy Management Inc.
Division of Erin Mechanical Inc.
5209 Detroit Avenue
Cleveland, OH 44102

Connecticut Energy Analysts
P.O. Box 1400
Fairfield, CT 06430

Conserval Engineering Inc.
855 Alness Street Unit 1
Downsview (Toronto)
Ontario, CANADA M3J2H8

Conservation Consultants
417 Thorn Street
Sewickley, PA 15143

*Consoil Associates
5 Riverside Drive
New York, NY 10023

Consulting Design Associates
1299 Stuyvesant Avenue
Union, NJ 07083

Consulting Engineering Services
128 McLean Street
Ballston Spa, NY 12020

Consulting Engineers - Mechanical,
Electrical, Energy Consultants, Inc.
201 West Fifth Street
Suite 113
Tulsa, OK 74103

Consumer Utilities Service Corp.
35 Liberty Road
Bergenfield, NJ 07621

CHW Energy Utilizers Inc.
(Krehbiel Associates Inc.)
12 Main Street
Hamburg, NY 14075

Table B-1 (Continued)

Contran Consultants Inc.
P.O. Box 1182
Jackson, MI 49204

Control Energy Inc.
P.O. Box 544
Glastonbury, CT 06033

Control Engineering
(Engineering Consultants)
1418 E. Fifth Street
Charlotte, NC 28204

*Control Junctions, Inc.
1365 Wiley Road, #145
Schaumburg, IL 60195

Controls, Service & Engineering Co., Inc.
195 Old York Road
New Cumberland, PA 17070

Coordinated Systems Inc.
Van Zelm, Heywood & Shadford Inc.
1007 Farmington Avenue
West Hartford, CT 06107

Cornerstones Energy Group Inc.
54 Cumberland Street
Brunswick, ME 04011

Corporate Energy Management, Inc.
2906 Brixham Drive
Richmond, VA 23235

Cost Reduction Inc.
1725 Washington Road
Pittsburgh, PA 15241

Council Shared Services
Unit of Hospital Council
of Southern California
6255 Sunset Blvd.
Los Angeles, CA 90028

Courter Energy Management
(Courter & Co., Inc.)
317 W. 13th Street
New York, NY 10014

Cowden Glass Engineering
Beardsley & Beardsley Architects
& Engineers, P.C.
64 South Street
Auburn, NY 13021

Crane Associates, Inc.
392 Springfield Avenue
Summit, NJ 07901

Crawford Electric Inc.
P.O. Box 787
West Chester, OH 45069

Creative Development Inc.
1328 N. Battlefield Blvd.
Suite A
Chesapeake, VA 23320

Creative Land Use
929 Pearl Street
Boulder, CO 80302

Creative Technology
P.O. Box 126
Moraga, CA 94536

CSL Energy Controls
CSL Industries
2029 Century Park East
Suite 110
Los Angeles, CA 90067

CSL Energy Controls, Inc.
One Century Plaza
2024 Century Park East
Los Angeles, CA 90067

Cuddy Energy Systems
1820 Willow Street
Mankato, MN 56001

Robert S. Curl & Associates
5330 East Main Street
Columbus, OH 43213

CVR Energy Specialists Inc.
Box 407
West Sand Lake, NY 12196

Jack Dale Associates Inc.
528 E. Joppa Road
Towson, MD 21204

Leo A. Daly
8600 Indian Hills Drive
Omaha, NE 68114

Dames & Moore
443 South Figueroa Street
Suite 3500
Los Angeles, CA 90071

Dammann Associates
11 Howard Street
Reading, PA 19609

Data Signal Corporation
40-44 Hunt Street
Watertown, MA 02172

Datrix Corporation
Four Madison Avenue
Larchmont, NY 10538

Daverman & Associates, P.C.
Systems Planning Corp.
500 S. Salina Street
Syracuse, NY 13202

Daverman Associates, Inc.
(Systems Planning Corp.)
82 Ionia Avenue, N.W.
Grand Rapids, MI 49503

Debar Business Services Inc.
530 S. Federal Highway
Suite 106
Deerfield Beach, FL 33441

Delta Energy Corporation
Unit of Delta Energy Group
625 Montrose Avenue
South Plainfield, NJ 07080

Delta Energy Services Inc.
280 So. Racebrook Road
Orange, CT 06477

Delta Energy Systems
Division of Amwell Industries Inc.
P.O. Box 252
Flemington, NJ 08822

Delta Engineering
(Standard/Consolidated Inc.)
11065 Hawthorne
Inwood, IN 46533

Denk-Kish Associates Inc.
19101 Villaview Road
Cleveland, OH 44119

Design Center Associates, P.C.
Box 735
169 Main Street
Dubuque, IA 52001

Diamond State Engineering Inc.
P.O. Box 485
Dover, DE 19901

DiClements-Siegel Engineering Inc.
22255 Greenfield Road
Suite 500
Southfield, MI 48075

Digital Control Systems Inc.
25942 La Cuesta Avenue
Laguna Hills, CA 92653

Diversified Energy Systems Consulting
Engineers, Inc.
1017 W. 9th Avenue
Suite D
King of Prussia, PA 19406

DKS Energy Consultants
Box 303
Meriden, NH 03770

Donohue/Engineers and Architects
4738 N. 40th Street
Sheboygan, WI 53081

Douglas Electric Company
9350 Byromar
Grosse Ile, MI 48138

Dunn & Wendel Architects & Engineers
800 Compton Road
Cincinnati, OH 45231

Durrant Engineers Inc.
Division of Durrant Group Inc.
2802 International Lane
Madison, WI 53704

Dutech Inc.
535 E. Idlewood Drive
Morton, IL 61550

Ebasco Services Inc./
Energy Conservation Division
Enserch Corporation
2 World Trade Center
New York, NY 10048

Table B-1 (Continued)

E-B-L- Engineers Inc.
305 W. Chesapeake Avenue
Towson, MD 21204

The ECE Group
205 Lesmill Road
Don Mills, Ont. M3B 2A5, CANADA

ECHO Energy Consultants Inc.
1615 Broadway #800
Oakland, CA 94612

Eclectic Energy Engineering/
AKH Associates
250 Gorge Road
Suite 16E
Cliffside Park, NJ 07010

Econergy, Inc.
2466 West 2nd Avenue
Denver, CO 80223

Economy Systems Ltd.
P.O. Box 2136
Ann Arbor, MI 48106

Econowatt Corporation
P.O. Box 321
Pelham, NY 10803

Econserv-Energy Conservation
Services
P.O. Box 88
Calimesa, CA 92320

Eder Associates
85 Forest Avenue
Box H
Locust Valley, NY 11560

EESCRO Electric Inc.
4432 Bristol Road
Oakford, PA 19047

Einhorn Yaffee Prescott Krouner
Broadway at Beaver
Box 627
Albany, NY 12201

Einhorn Yaffee Prescott Krouner, P.C.
Broadway at Beaver Street
Box 1842
Albany, NY 12207

EKONO Inc.
Unit of EKONO Oy (Finland)
410 Bellevue Way S.E.
Bellevue, WA 98004

Electrical Design & Construction
3633 W. MacArthur Blvd. #407
Santa Ana, CA 92704

Electrical Systems Testing Inc.
10873 Portal Drive
Los Alamitos, CA 90720

Electricity Savers Corp.
3934 N.W. 24th Street
Miami, FL 33142

Elgee Electric Co.
1030 W. Third Avenue
Columbus, OH 43212

Ellerbe Associates Inc.
One Appletree Square
Minneapolis, MN 55420

Eller Energy Management Inc.
1388 Freeport Road
Pittsburgh, PA 15238

Ellers, Fanning, Oakley, Chester
& Rike, Inc.
700 Falls Building
Memphis, TN 38103

EMA Inc.
270 Metro Square Bldg.
St. Paul, MN 55101

The EMAR Group
40 West Main Street
Macungie, PA 18062

*EMC Inc. of Virginia
374 Maple Avenue, East
Suite 204
Vienna, VA 22180

EMC Engineers Inc.
P.O. Box 17479
1433 Seventeenth Street
Denver, CO 80217

EMC Engineers, Inc.
Box 36009
2750 S. Wadsworth, #201
Denver, CO 80236

Empire Energy Management Inc.
4 Madison Avenue
Larchmont, NY 10538

Empire Energy Systems Inc.
200 Route 17S-85
Mahwah, NJ 07430

EMS Energy Management Systems
(Top Construction Co.)
4612 W. 137th Street
Crestwood, IL 60445

Encon Service Co. Inc.
177 F. Riverside Avenue
Newport Beach, CA 92663

Enconco
Energy Conservation Consultants
201 Edgewood
Baytown, TX 75520

Encotech Inc.
434 State Street
7th Floor
P.O. Box 714
Schenectady, NY 12301

Enertom Inc.
2323 South Hardy
Tempe, AZ 85282

Enertom Consultants Inc.
1727 Atwood
Longmont, CO 80501

Enertom Ltd.
300 Davis Street
Evanston, IL 60201

*Energard Corporation
P.O. Box 4241
Bellevue, WA 98009

Energistics, Inc.
P. O. Box 695
E. Brunswick, NJ 08816

Energistics Inc.
P.O. Box 943
Neptune, NJ 07753

Enertom Inc.
The Thomas Block
116 Commercial Street
Portland, ME 04101

Energy Accounting Systems Inc.
P.O. Box 4225
2608 Cumberland Drive
Macon, GA 31208

Energy Advancement, Inc.
P.O. Box 249
35504 Cooper Road
Brookshire, TX 77243

Energy Analysis Inc.
P.O. Box 8395
Jackson, MS 39204

Energy Applications, Inc.
227 Long Reach Village Center
Columbia, MD 21045

Energy Associates
P.O. Box 157
N. Quincy, MA 02171

*Energy Audit Corporation
1723 Howard Street
Evanston, IL 60202

Energy Auditors & Consultants
P.O. Box 723
Amherst, MA 01004

Energy Automation Consultants
2601 Dauphin Street
Mobile, AL 36606

Energy Automation, Inc.
1289 Ashland Road
P.O. Box 1
Ashland, OH 44805

Energy Awareness Inc.
2315 Southwest Freeway
Suite 108
Houston, TX 77098

Energy Clinic Corporation
1975 Diamond Blvd.
Concord, CA 94520

Table B-1 (Continued)

Energy Concepts Inc.
1337 Pearl Street
Waukesha, WI 53186

Energy Conservation Engineering
1111 King Charles Court
Palatine, IL 60067

Energy Conservation Management
and Associates
Division of Ramsey International
4105 North Fairfax Drive, Suite 111
Arlington, VA 22203

Energy Conservation Management Corp.
Pflum, Klausmeier & Wagner
Consultants
424 E. Fourth Street, 3rd Floor
Cincinnati, OH 45202

Energy Conservation Management
of Louisiana Inc.
P.O. Box 6723
Metairie, LA 70009

Energy Conservation Systems, Inc.
P.O. Box 1473
Pine Bluff, AR 71613

Energy Conservation Technicians
Division of Worcester
Air Conditioning Co., Inc.
148 Pleasant Street
P.O. Box 100
Ashland, MA 01721

Energy Conservation Techniques
10005 Cherry Ridge
P.O. Box 35083
Louisville, KY 40232

The Energy Conserve-a-Tory
Bristol County Energy Corp., Inc.
1240 Wilbur Avenue
Somerset, MA 02725

Energy Consultants Inc.
121 Wyck Street
Suite 208
Richmond, VA 23225

Energy Consulting Services
P.O. Box 1304
Scottsdale, AZ 85251

Energy Consultation & Management
W.S. Daving Building
Suite 213
123 N. Kalamazoo Mall
Kalamazoo, MI 49007

Energy Control Consultants, Inc.
5240 S. W. 6th Street
Plantation, FL 33317

*Energy Control Systems (E.C.S.)
P.O. Box 70248
Charleston Heights, SC 29405

Energy Control Systems, Inc.
828 E. Levealing Blvd.
Maynard, CA 94541

*Energy Control Technology, Inc.
Suite 800
1419 Broadway
Oakland, CA 94612

Energy Conversion Alternatives Ltd.
2101 Connecticut Avenue, N.W.
Suite 67
Washington, DC 20008

Energy Design Research Inc.
P.O. Box 12605
Fresno, CA 93778

Energy Design Systems
1145A Mission Street
San Francisco, CA 94103

Energy Economics Research Inc.
P.O. Box 1248
Mechanicsburg, PA 17055

Energy Efficiency Consultants
405 Main Street
Riverton, NJ 08077

Energy Efficiency Planning
139 Red Mill Road
Peekskill, NY 10566

Energy Emporium Inc.
14040-42 Vanowen Street
Van Nuys, CA 91405

Energy Engineering Associates
P.O. Box 49134
Austin, TX 78765

Energy Engineering Associates Inc.
3405 North I.H. 35
Austin, TX 78722

Energy Engineering Company
22910 Market Street
Newhall, CA 91321

Energy Engineers Inc.
P.O. Box 1710
Pensacola, FL 32598

Energy & Environmental
Analysis, Inc. (EEA, Inc.)
1111 N. 19th Street
Arlington, VA 22209

Energy & Environmental Analysts, Inc.
55 Hilton Avenue
Garden City, NY 11530

Energy Evaluations Ltd.
823 South 22nd Street
Omaha, NE 68108

Energy for America Inc.
47 Maple Street
Summit, NJ 07901

Energy Investment Inc.
286 Congress Street
Boston, MA 02210

Energy Investment Inc.
175 Federal Street
Boston, MA 02110

Energy Law Institute
(Franklin Pierce Law Center)
2 White Street
Concord, NH 03301

Energy Management Association, Inc.
104 E. Seventh
Covington, KY 41012

*Energy Management Concepts
145 North Lucie Avenue
De Land, FL 32720

Energy Management Consultants
P.O. Box 665
Merrimack, NH 03054

Energy Management Consultants Inc.
5 Pinecrest Drive
Simsbury, CT 06070

Energy Management & Control Co.
(LMS W Engineers, P.A.)
634 Harrison Street
Suite B
Topeka, KS 66603

Energy Management Controls
3521 Florida Avenue
Kenner, LA 70062

Energy Management Controls
276 S. Logan Street
Elyria, OH 44036

Energy Management Engineering
2438 Viscount Row
Orlando, FL 32806

Energy Management Engineering, Inc.
7957 California Avenue
Fair Oaks, CA 95628

Energy Management & Environmental
Services
1498 Applegate
Naperville, IL 60565

*Energy Management Group
P.O. Box 1198
San Rafael, CA 94915

Energy Management, Inc.
200 Boylston Street
Chestnut Hill, MA 02167

Energy Management Services
2933 E. 3300 S.W.
Salt Lake City, UT 84109

Energy Management Specialists Inc.
4650 W. 160th Street
Cleveland, OH 44135

*Energy Management Systems Company
5400 Bosque Sculevard
Suite 460
Waco, TX 76710

Table B-1 (Continued)

Energy Management Systems, Inc.
P.O. Box 30
Naugatuck, CT 06770

Energy Master of Maryland Inc.
12021 Old Gunpowder Road
Beltsville, MD 20705

Energy Master Systems
Division of Energy Master Inc.
2226 West Oakfield Road
Buffalo, NY 14072

Energy Materials Research Company
2547 8th Street
Berkeley, CA 94710

Energy Planning Associates
5757 Bellaire Blvd.
Houston, TX 77081

Energy Planning, Inc.
52 Province Street
Boston, MA 02108

Energy and Process Systems Inc.
(EPSI)
P.O. Box 670
1325 Laurel Street
San Carlos, CA 94070

Energy Professionals Recruiting
Applied Resources Inc.
P.O. Box 252
Medford, MA 02155

Energy Professionals Recruiting
(Applied Resources Inc.)
P.O. Box 346
Medford, MA 02155

Energy Recovery Engineering Inc.
12248 Spring Trail
Lakeview Terrace, CA 91342

Eric Inc.
Energy Recovery for Industry &
Commerce, Inc.
3810 First Avenue. N.
Birmingham, AL 35222

Energy Recovery for Industry
& Commerce Inc. (ERIC)
2714 20th Street S.
Birmingham, AL 35209

Energy Research and Design
Associates
P.O. Box 3177
247 W. Hansen
Jackson, WY 83001

Energy Research Group Inc.
Box 323
Canton Professional Center
Canton, CT 06019

Energy and Resource
Consultants Inc.
P.O. Box 0
Boulder, CO 80306

Energy Resource Management Co.
375 Temple Street
New Haven, CT 06511

The Energy Resource Management Co.
P.O. 1515
Meigswood Park
Madison, CT 06443

Energy Resources, Inc.
350 Essex Court
Regency Park
Omaha, NE 68114

*Energy Resources LTD
Suite H
605 South Palm Street
La Habra, CA 90631

Energy Resources & Planning Inc.
28 E. Jackson Bldg.
Chicago, IL 60604

Energy Saver Systems
1484 No. Kraemer Blvd.
P.O. Box 1982
Placentia, CA 92670

The Energy Savers
Lee Allen Electric Heat Co. Inc.
RD 1, Box 533A
Applegarth Road
Hightstown, NJ 08520

*Energy Savers of the South
4514 Pine Mountain Road
Birmingham, AL 35213

Energy Services Bureau, Inc.
P.O. Box 16201
Plantation, FL 33318

Energy Services, Inc.
510 Fairgrounds Court
Nashville, TN 37211

Energy Services and Management Corp.
125 High Street
Suite 903
Boston, MA 02110

Energy-Sol Associates Inc.
97-45 Queens Blvd.
Forest Hills, NY 11374

*Energy Solutions, Inc.
P.O. Box 1062
Freehold, NJ 07728

Energy Solutions Inc.
5575 Poplar Avenue
Suite 612
Memphis, TN 38119

Energy Strategies Inc.
96 Windsor Gate
North Hills, NY 11040

Energy Systems Engineering Inc.
10605 Concord Street
Suite 204
Kensington, MD 20795

Energy Systems Management Inc.
12191 Ralston Road
Suite 100
Arvada, CO 80004

Energy Systems Planning Inc.
701 Welch Road
Suite 1105
Palo Alto, CA 94304

Energy Systems Research Group
120 Milk Street
Boston, MA 02109

Energy Technology Resources Inc.
15808 Highwood Drive
Minnetonka, MN 55343

Energy Training & Education
Center
P.O. Box 58
Northampton, MA 01061

Energy Utilization & Development
Service
260 Plymouth Bldg.
Minneapolis, MN 55402

Energy & Value Consultants Inc.
105 Lake Hill Road
Burnt Hills, NY 12027

Energyworks, Inc.
45 Border Street
West Newton, MA 02165

Engard Corporation
(Engard, Inc.)
15534 W. Hardy, Suite 120
Houston, TX 77060

Engineer Incorporated
(E.I. Industries)
50 Park Place
Newark, NJ 07101

*Engineered Systems, Inc.
6767 Forest Hill Avenue
P.O. Box 13199
Richmond, VA 23225

Engineering Design & Management Inc.
1101 Lucas, Box 1159
St. Louis, MO 63188

Engineering Interface Ltd.
Ste. 200
2 Sheppard Avenue, East
Willowdale, Ontario
CANADA M2N5Y7

Engineering Systems Inc.
750 Exeter Road
Hampton, NH 03842

Ener Pak Inc.
550 Old Country Road
Ricksville, NY 11801

Ener-Sol Associates Inc.
97-45 Queens Blvd.
Rego Park, NY 11374

Table B-1 (Continued)

Enserv Co., Inc.
5135 Port Chicago Highway
Concord, CA 94520

*Ensotax Corporation
Energy Management Systems
P.O. Box 8762
Corpus Christi, TX 78412

Entech Engineering Associates
828 Penn Street
P. O. Box 32
Reading, PA 19603

Entech Engineering Consultants
400 Mansion House 1 Center, N2010
St. Louis, MO 63102

Entech, Inc.
1204 W. Madison
Ann Arbor, MI 48103

Entek Associates, Inc.
P.O. Box M
College Station, TX 77840

Envirocon Energy Systems, Inc.
9350 Byromar Lane
Grosse Ile, MI 48138

Environmental Associates Inc.
11602 N. 51st Street
Tampa, FL 33617

Environmental Energy Management
System
23845 Holman Highway
Monterey, CA 93940

Environmental Interfaces Inc.
2795 Randi Lane
Salem, OR 97303

A. Epstein and Sons Inc.
A. Epstein and Sons International
2011 West Pershing Road
Chicago, IL 60609

David R. Eshleman, P.E.
301 Pasture Lane
Raleigh, NC 27614

ESCCO
4412 S. 89th Street
Omaha, NE 68127

ESI, Inc.
4926 Adams Road
Hixson, TN 37343

E-Squared Engineering, Inc.
14610 Carmenita Road
Norwalk, CA 90650

ETA Engineering Inc.
415 E. Plaza Drive
Westmont, IL 60559

ETAP Inc.
(Energy Technology Applications)
1522 S. Beulah Street
Philadelphia, PA 19147

Ewing Cole Cherry Parsky
Federal Reserve Bank Bldg.
100 N. 6th Street
Philadelphia, PA 19106

Gada & Associates Inc.
10300 Soo Line Bldg.
Minneapolis, MN 55402

Galehouse & Associates
1 First National Plaza
Dayton, OH 45402

Cary B. Gamble & Associates Inc.
P. O. Box 19261
New Orleans, LA 70179

M. Garetano Associates Inc.
148 E. Main Street
Huntington, NY 11743

Garratech Ltd.
P. O. Box 7387
North Kansas City, MO 64116

Gatchell & Associates, Inc.
31487 Northwestern Hwy.
Farmington Hills, MI 48018

Gatley & Associates Inc.
489 Westover Drive N. W.
Atlanta, GA 30305

Gausman & Moore, Inc.
700 North Robert Street
St. Paul, MN 55103

Paul L. Geiringer and Associates
The Geiringer Organization
145 Main Street
Port Washington, NY 11050

General Energy Services
104 Lexington Avenue
Buffalo, NY 14222

*General Sound Telephone Company, Inc.
GST Energy Systems
1216 Washington Street
Allentown, PA 18102

General Systems Inc.
1360 W. 9 Street
Cleveland, OH 44113

Thomas J. Gerard & Assoc. Inc.
N. 1322 Post
Spokane, WA 99201

Gershman, Brickner & Bratton Inc.
1025 Vermont Avenue N.W.
Suite 608
Washington, DC 20005

Gibbs & Hill, Inc.
11 Penn Place
393 Seventh Avenue
New York, NY 10001

Gibbs Service Co. Inc.
350 Smokey Lane
P. O. Box 15776
N. Little Rock, AR 72231

Giffels Associates Inc.
25200 Telegraph Road
Southfield, MI 48037

Gilbert/Commonwealth
(Gilbert Associates, Inc.)
P. O. Box 1498
Reading, PA 19603

Gilford, Deringer & Co.
719 8th Street S. E.
Washington, DC 20003

Gillan and Hartmann Inc.
P. O. Box 345
Valley Forge, PA 19481

Clarence Gilmore & Associates Inc.
1100 Republic Bank Tower
Dallas, TX 75201

Gilstrap and Associates Inc.
180 S. Weidman Road
Suite 218
Manchester, MO 63011

Girard Engineering
1481 Chain Bridge Road
McLean, VA 22101

Glaus Pyle Dehaven Assoc. Inc.
345 White Pond Drive
Akron, OH 44320

*Godbeer, Godbeer & Associates
U.S. East Coast Office
New London, NH 03257

M. Goldberg-Energy Consultant
22 Colgate Lane
Woodbury, NY 11797

R. D. Goss Inc.
R519 Williams Street
Clearfield, PA 16830

John Graham and Co.
1110 3rd Avenue
Seattle, WA 98101

The Gratiot Engineering Company
39 Central Street
Box 453
Woodstock, VT 05091

Paul S. Gray Co. Inc.
Box 431
1301 Cannon Circle
Faribault, MN 55021

Great Lakes Controlled Energy Corp.
613 Pickwick Court
Mt. Prospect, IL 60056

Groover Engineering Co. Inc.
4258 Woodland Brook Drive
Atlanta, GA 30339

Grumman Energy Conservation Services
Grumman Aerospace Corporation
Mail Stop B30-30
Bethpage, NY 11714

Table B-1 (Continued)

Guernsey Building Mgmt. Services
19 Border Road
Concord, MA 01742

Gulf South Engineers, Inc.
P. O. Box 4160
New Orleans, LA 70178

John J. Guth Associates, Inc.
208 Milam Street
Shreveport, LA 71101

Salvatore Guzzardi Inc.
250 S. 13th Street
Philadelphia, PA 19107

H-B Energy Division
Hughes-Bechtol Inc.
6060 Milo Road
Dayton, OH 45414

H & S United Consulting Engineers
8000 N. Hale Avenue
Peoria, IL 61615

HSR Associates Inc.
100 Milwaukee Street
La Crosse, WI 54601

Ernst R. Habicht, Jr., Ph.D.
P. O. Box 65
Port Jefferson, NY 11777

Hagler, Bailly & Company Inc.
2020 K. Street N.W.
Suite 350
Washington, DC 20006

Hamlin and Associates Inc.
2203 Holyoke Avenue
Bradenton, FL 33507

Hampton Roads Energy Management
28 Research Drive
Hampton, VA 23666

Hankins and Anderson Inc.
1604 Santa Rosa Road
Richmond, VA 23288

Harley Ellington Pierce Yee Associates
26111 Evergreen Road
Southfield, MI 48076

Harmax Corp.
6224 Orange Street
Los Angeles, CA 90048

R. D. Harper & Associates
415 East Gregory Blvd.
Kansas City, MO 64131

Fred C. Hart Associates Inc.
1110 Vermont Avenue N. W.
Washington, DC 20005

The Hartman Company
1016 N. 36th Street
Seattle, WA 98103

The Haskell Co.
720 S. Gilmore Street
Jacksonville, FL 32204

Havac Control Systems Inc.
80 Industrial Park Road
Middletown, CT 06457

Hawker Siddeley Power Engineering
(Hawker Siddeley Group)
8550 Katy Freeway, Suite 118
Houston, TX 77024

Hayes, Seay, Mattern and Mattern
1315 Franklin Road
P. O. Box 13446
Roanoke, VA 24016

Heapy Engineering
200 S. Keowee Street
Dayton, OH 45402

The Heat Conservation Company Inc.
P. O. Box 600
88 Ridge Street
Glens Falls, NY 12801

Heaton-Levine Energy Management Engineers
1145-A Mission Street
San Francisco, CA 94103

Heery Energy Consultants Inc.
Heery Int'l.
880 W. Peachtree Street N. W.
Atlanta, GA 30367

Henningson, Durham & Richardson Power
and Energy Division
5401 Gamble Drive
Minneapolis, MN 55416

F. A. Hepperle, Architect
26 Journal Square
Jersey City, NJ 07306

Herman Energy Services
437 Upper Gulph Road
Radnor, PA 19087

Herzog-Hart Corp.
Hart Corp.
462 Boylston Street
Boston, MA 02116

Hillsboro Electric,
Energy Management Division
3914 Hillsboro Circle
Nashville, TN 37215

Hittman Associates Inc.
Division of Hittman Corp.
9190 Red Branch Road
Columbia, MD 21045

Hixson Architects-Engineers
144 Merchant Street
Cincinnati, OH 45246

HNTB Energy Management
600 108th Avenue N.E.
Bellevue, WA 98004

Hoad Engineers Inc.
Blount International Ltd.
1159 E. Michigan Avenue
Ypsilanti, MI 48197

Holec Systems B. V.
(Holec, N. V.)
Hoevenweg 1
P. O. Box 2300
5600 CH Eindhoven, HOLLAND

Holmes & Narver Inc.
(United States Filter)
999 Town & Country Road
Orange, CA 92668

Honeywell Corporation
Commercial Buildings Group
Honeywell Plaza
Minneapolis, MN 55408

Hospital Utility Management Inc./
Industrial Utility Management
3402 Route 8
Allison Park, PA 15101

Hough Associates
One Bala Place
Bala Cynwyd, PA 19004

Hoyem-Basso Assoc. Inc.
(Giffels Assoc.)
25 W. Long Lake Road
Cloomfield Hills, MI 48013

Hueber Hares Glavin
726 W. Onondaga Street
Syracuse, NY 13204

Huges Energy Management Systems
2922 1/2 Durfee Avenue
P. O. Box 3592
South El Monte, CA 91733

N. Howard Humphrey Electric Inc.
518 W. Las Tunas Drive
Arcadia, CA 91006

Hurley Associates
2268 Main Street
Stratford, CT 06497

Hurst Associates Ltd.
5755 Granger Road
Independence, OH 44131

Independent Energy Auditing Company
157 Bowles Park
Springfield, MA 01104

Industrial Energy Inc.
1111 N. 19th Street
Arlington, VA 22209

Industrial Energy Services Co.
The Express House
Station Square
Pittsburgh, PA 15219

Industrial Systems Corp.
1264 Union Street
West Springfield, MA 01089

Table B-1 (Continued)

Industrial Utility Management,
Hospital Utility Management Inc.
3402 Route 8
Allison Park, PA 15101

Insights West Inc.
900 Wilshire Blvd.
Suite 1100
Los Angeles, CA 90017

Intelligence for Energy Inc.
Abrams & Moses, Consulting Engineers
1 Mayfair Road
Eastchester, NY 10707

International Energy Conservation Services
5600 Roswell Road, N.E. Atlanta
Suite 100
Prado West
Atlanta, GA 30342

International Technology Corp.
1670 Highway A1A
Satellite Beach, FL 32937

I. Ionesco-Consulting Engineer
P. O. Box 697
Stratford, CT 06497

IPS Engineers, Inc.
3849 Plaza Tower Drive
Baton Rouge, LA 70816

*Jazco Corporation
P.O. Box 200
Massapequa, NY 11762

Jazco Corp.
3 Manor Road N.
Greenlawn, NY 11740

Jensen Associates, Inc.
84 State Street
Boston, MA 02109

Johnson Controls, Inc.
507 E. Michigan Street
P.O. Box 423
Milwaukee, WI 53201

Hadley H. Jones, P. E.
512 Nevada Drive
Erie, PA 16505

Phillip R. Jones & Associates
1419 N. Palafor Street
Pensacola, FL 32501

Jordan, Jones and Goulding Inc.
2000 Clearview Avenue N. E.
Suite 200
Atlanta, GA 30340

J. J. Kahn Energy Consultant
3312 Shepherd Street
Chevy Chase, MD 20815

El: G. Katz Associates Inc.
404 S. W. Dixie Highway
Hollendale, FL 33009

K/C Engineering
601 N. W. Harmon Boulevard
Bend, OR 97701

Keeler Associates
109 Central Avenue
Cheltenham, PA 19012

Keikruchek Engineers Inc.
3312 S. W. Kelly Avenue
Portland, OR 97201

Keller & Gannon, Lester B. Knight
& Associates Inc.
560 Mission Street
San Francisco, CA 94105

Kernan Consultants Inc.
27 Acken Drive
Clark, NJ 07066

Keyser-Culbertson Inc.
(Schesser-Buckley-Keyser)
2410 Massillon Road
Akron, OH 44312

L. Robert Kimball & Associates
615 W. Highland Avenue
Ebensburg, PA 15931

Kindle, Stone & Associates, Inc.
3218 North Fourth Street
Longview, TX 75601

Kinetics Consulting Group
100 Colony Square, Suite 2301
Atlanta, GA 30305

A. M. Kinney, Inc.
2900 Vernon Place
Cincinnati, OH 45219

Norbert H. Kirchgessner
80 Doncaster Road
Kenmore, NY 14217

Kling-Lindquist Inc.
2301 Chestnut Street
Philadelphia, PA 19103

Lester B. Knight & Associates Inc.
549 W. Randolph Street
Chicago, IL 60606

Kenneth J. Kogut & Associates
5232 W. 170 Place
Oak Forest, IL 60452

Kohlenberger Associates Consulting Engineers Inc.
P. O. Box 5037
1309 W. Valencia Drive
Fullerton, CA 92635

*Koster/Hopkins & Co., Inc.
2341 Cedar Shores Circle
Jacksonville, FL 32210

*KRS Energy Control, Inc.
P.O. Box 712
Carmel, IN 46032

Charles D. Laderoute, Ltd.
4903 Stearns Hill Road
Waltham, MA 02154

Lafayette Engineers, Inc.
P. O. Box 1057
Lafayette, CA 94549

Ralph M. Lamada, P.E.
Georgia Tech. EES/TAL
Atlanta, GA 30332

Laramore, Douglass & Popham
332 S. Michigan Avenue
Chicago, IL 60604

The Latham Consulting Group
Building Consultants Inc.
17 Peter Drive
Albany, NY 12205

Leasing Services, Inc.
45 Newbury Street
Boston, MA 02116

LeBlanc & Assaf and Assoc.
2223 Quail Run Drive
Suite F
Baton Rouge, LA 70806

Lehigh Energy Consultants
528 N. New Street
Bethlehem, PA 18018

Lehr Associates
130 W. 30th Street
New York, NY 10001

R. C. LeMay Associates Inc.
4116 Main Drive
Lafayette Hill, PA 19444

H. F. Lenz Co.
1732 Lyter Drive
Johnstown, PA 15905

Steven Levy Associates
3127 N. Calvert Street
Baltimore, MD 21218

Lewin & Associates Inc.
1090 Vermont Avenue N. W.
Washington, DC 20005

Harold S. Lewis Consulting Engineers
47 Sturges Ridge Road
Wilton, CT 06897

Sheldon Licht A. I. A.
(Charles Licht Engineering Assoc.)
211 East 46 Street
New York, NY 10017

Lighting Technology Inc.
2115 112th Avenue N.E.
P. O. Box 3532
Bellevue, WA 98009

Al Limburg, Coordinator of
Energy Services
P. O. Box 186
Warren, MI 48090

Table B-1 (Continued)

EE Linden Associates Inc.
5 Brook Street
Darien, CT 06820

Lizardos Engineering Associates, P. C.
1125 Willis Avenue
Albertson, NY 11507

Lloyds Engineering
P. O. Box 209
Barrington, IL 60010

Lockwood, Andrews & Newnam, Inc.
1500 Citywest Blvd.
Houston, TX 77042

Lockwood, Andrews & Newnam Inc.
1900 St. James Place
Houston, TX 77056

Lockwood Greene Engineers Inc.
1330 W. Peachtree Street, N. W.
Atlanta, GA 30367

Lockwood Greene Engineers
P. O. Box 491
Spartanburg, SC 29304

Peter F. Loftus Corp.
900 Chamber of Commerce Bldg.
Pittsburgh, PA 15219

Londe Parker Michels Inc.
(Londe Parker Inc.)
6096 Lemay Ferry Road
St. Louis, MO 63129

London Associates
(W. P. London & Assoc. Ltd.)
2 Buffalo Avenue
Niagara Falls, NY 14303

William A. Lotz, P. E.
Acton Ridge Road
E. Wakefield, NH 03830

Love, Friberg & Associates Inc.
1414 Oil & Gas Bldg.
Fort Worth, TX 76102

*Lumenetika Energy Corp.
Illumination Engineers
Energy Consultants
323-B Spreckels Drive
Aptos, CA 95003

Lundberg Survey Inc.
P. O. Box 3996
North Hollywood, CA 91609

Jim Lynas Electric
1160 E. Sonora Street
San Bernardino, CA 92404

M3 Engineering Group
601 NBC Center
Lincoln, NE 68508

Madison Consulting Group
301 North Broom Street
Madison, WI 53703

Chas. T. Main, Inc.
Prudential Center
Boston, MA 02199

C. T. Male Associates, P. C.
3000 Troy Road
Schenectady, NY 12309

Malone & Associates
9821 W. Meadow Park Drive
Hales Corner, WI 53130

William Mandel Co.
22203 John R.
Hazel Park, MI 48030

Matney-Frantz Engineering
849 W. Main Street
Bozeman, MT 59715

Mayes, Sudderth & Etheredge, Inc.
1785 The Exchange
Atlanta, GA 30339

McCaughey & Smith Energy Associates
130 Centennial Way
Suite C
Tustin, CA 92680

McClure Engineering Associates, Inc.
P. O. Box 808
East Moline, IL 61244

McFall Konkel & Kimball C. E. Inc.
2160 S. Clermont Street
Denver, CO 80222

The McGuire & Shook Corp.
7440 N. Shadeland
Indianapolis, IN 46250

Mechanical Controls Inc.
(Robertshaw Controls Co.)
11000 Capital Avenue
Oak Park, MI 48237

Mega Engineering
10800 Lockwood Drive
Silver Spring, MD 20901

ME Systems, Inc.
P. O. Box 275
Canfield, OH 44406

Metcalf & Eddy, Inc.
One Radel Avenue
Bound Brook, NJ 08805

Metcalf & Eddy Inc.
Unit Research/Cottrell
50 Staniford Street
Boston, MA 02114

Metro Energy Systems, Inc.
313 E. 53 Street
New York, NY 10022

Michaud, Cooley, Hallberg,
Erickson & Assoc.
310 Plymouth Bldg.
Minneapolis, MN 55402

*MicroControl Systems Inc.
The Energy Systems Company
6579 North Sidney Place
Milwaukee, WI 53209

Mid-South Engineering Co.
P. O. Box 1399
Hot Springs, AR 71901

Midwest Energy Consultants
(Kutten Energy Management)
1 S. 376 Summit Court B
Suite 3
Oak Brook Terrace, IL 60181

A. R. Miller & Associates
P. O. Box 699
Brockton, MA 02403

David Mittman
51 E. 42nd Street
New York, NY 10017

Mizermatic
308 Main Street
Orange, NJ 07050

Moffat Engineering Ltd.
55 Eglinton Ave., E.
Toronto
Ontario M6P 1G8 CANADA

Monegon Ltd.
4 Professional Drive, Suite 130
Gaithersburg, MD 20760

Monsen Engineering Co.
5 Montesano Road
Fairfield, NJ 07006

The Montgomery Wells Co.
602 Starks Bldg.
Louisville, KY 40202

Harvey Morris Associates Inc.
1099 Wall Street West
Lyndhurst, NJ 07071

MPA & LEI
218 S. Frances Street
South Bend, IN 46617

MSM Consultants Inc.
2601 Wyoming Blvd., N.E.
Albuquerque, NM 87112

Mueller Associates Inc.
1900 Sulphur Spring Road
Baltimore, MD 21277

John G. Muller
7817 Calpurnia Court
McLean, VA 22102

Munson Electric Inc.
3836 Clark Rd. S.E.
Cedar Rapids, IA 52403

Murphy Engineering
2202 W. Thomas Road
Phoenix, AZ 85015

Table B-1 (Continued)

Donald F. Nardy & Associates, Inc. 2102 Market Street Philadelphia, PA 19103	Northeastern Solar Management 15 Bond Street Great Neck, NY 11021	Process Development Corporation 1534 Ashford Hollow Lane Houston, TX 77077
National Economic Research Associates Inc. 5 World Trade Center 8th Floor New York, NY 10048	Northern Energy Corporation 470 Atlantic Avenue Boston, MA 02210	Process Engineers 357 Main Street Trappe, PA 19426
National Electric Service Corp. 20 E 46 Street New York, NY 10017	Northern Engineering Associates 177 Battery Street Burlington, VT 05401	Process Engineers Design & Construction Inc. 477 Main Street Collegeville, PA 19426
National Energy Research, Development and Testing Laboratories 881 Dover Drive, Suite 25 Newport Beach, CA 92663	Nova Systems 39 Washington Avenue Point Richmond, CA 94801	Process Systems Inc. 8334A Arrowridge Blvd. Box 240451 Charlotte, NC 28224
National Marketing Consultants 12 Winnipauk Drive Norwalk, CT 06851	NRG Industries Inc. 67 Walnut Avenue Clark, NJ 07066	Professional Energy Services Division of Griffey Contracting Service Inc. 210 West King Street Kokomo, IN 46901
Natkin Energy Management Natkin & Co. (Fischback Corp.) 2775 So. Vallego P. O. Box 1598 Englewood, CO 80150	NUS Corporation Halliburton Co. 4 Research Place Rockville, MD 20850	Project Management Engineering P. O. Box 1426 2509 Keith Drive Columbia, TN 38401
New Brunswick Research and Productivity Council College Hill Road, P. O. Box 6000 Fredericton New Brunswick E3B 5H1 CANADA	O'Brien & Associates Inc. 335 South 11th Street San Jose, CA 95112	QBIC Quality Build Inspec. Corp. 4827 Rugby Avenue Bethesda, MD 20814
New Energy West Inc. 2030 Bridgeway Suite 215 Sausalito, CA 94965	O'Brien & Gere Engineers Inc. 1304 Buckley Road Syracuse, NY 13221	QLA Inc. 2036 Pierce Mill Road, N.W. Washington, DC 20010
New England Energy Management Systems, Inc. 25 Research Drive Westborough, MA 01581	O'Dea, Mitchell & Golaszewski P.C. 701 Westchester Avenue White Plains, NY 10604	Ransom & Casazza, Inc. 1000 Connecticut Avenue, N.W. Washington, D.C. 20036
New Era Diversity Inc. 901 Washington Street Wilmington, DE 19899	Omega Resources Management 914 E. Queens Court, Suite A Santa Maria, CA 93454	RDH Engineering Inc. 6581 Gillis Drive San Jose, CA 95120
Newell Garfield Inc. 310 Madison Avenue New York, NY 10017	O'Neill Plumbing & Heating Inc. 400 Agnew Road Jeannette, PA 15644	Recon Systems Inc. P. O. Box 842 51 5th Street Somerville, NJ 08761
New Hampshire Energy Management Box 348 Durham, NH 03824	The Orkand Corp. 8630 Fenton Street Suite 938 Silver Spring, MD 20910	Recon Systems, Inc. P. O. Box 460 Route 202 North Three Bridges, NJ 08887
New Mexico Energy Resource Center 11311A Menaul Blvd., N.E. Albuquerque, NM 87112	Lester Ostroy & Associates 5772 Ludlow Garden Grove, CA 92645	Red Eye Corporation 207 Brant Road Lake Park, FL 33403
New York Energy Works Inc. 11 Phoenix Street Hempstead, NY 11550	Ottaviano Technical Services Inc. 150 Broad Hollow Road Melville, NY 11747	Reliance-Energy Auditing Reliance Electric-Services Division 6680 Beta Drive Cleveland, OH 44143
North Coast American Technology (Air Temp Climate Control) 1427 Lakeside Avenue Cleveland, OH 44114	Owen & Mayes Inc. 1106 Laxton Road Lynchburg, VA 24502	Reliance Energy Services (Reliance Group Inc.) 111 W. 40th Street New York, NY 10018
Northeast Energy Auditing Team Inc. 7453 Morgan Road Liverpool, NY 13088	Pacific Energy Management Consultants P.O. Box 8888 Tamuning, GUAM 96911	Resource Development Associates 5060 Wadsworth Road Dayton, OH 45414
	Pacific Energy Spectrum 11941 Wilshire Blvd. Los Angeles, CA 90025	

Table B-1 (Continued)

Resource Planning Associates Inc.
50 Church Street
Cambridge, MA 02138

Reynolds, Smith and Hills
Architects-Engineers-Planners Inc.
4019 Boulevard Center Drive
Jacksonville, FL 32207

Rist-Frost Associates
21 Bay Street
Glens Falls, NY 12801

The RHM Group, Inc.
405 Urban Street
Denver, CO 80228

*Roanoke City Public Schools
P.O. Box 13105
Roanoke, VA 24031

Rosenfeld, Steinberg, and Associates
2102 6th Street
Santa Monica, CA 90405

F. J. Rospond Associates, Inc.
395 Franklin Street
P. O. Box 1408
Bloomfield, NJ 07003

Ross & Baruzzini Inc.
7912 Bonhomme
St. Louis, MO 63105

Rowcon Technology Inc.
49 Storrs Heights Road
Storrs, CT 06266

The Rust Engineering Co.
Wheelabrator-Frye Inc.
P. O. Box 101
1130 S. 22 Street
Birmingham, AL 35201

Sachs Energy Management Systems, Inc.
Division of Sachs Electric Company
P.O. Box 96
St. Louis, MO 63166

St. John Associates Engineers, P.C.
1117 Front Street
Binghamton, NY 13905

Walt Sampson, P.E.
1161 6th Street
Boulder, CO 80302

Samyn-D'elia, Architects
Main Street
P.O. Box 687
Ashland, NH 03217

Saren Engineering, Inc.
270 Farmington Avenue
Farmington, CT 06032

*Savage Engineering
1224 Farmington Avenue
West Hartford, CT 06107

Scallop Thermal Management, Inc.
80 Fifth Avenue
New York, NY 10020

Larry L. Schedin Associates
2011 West Franklin Avenue
Minneapolis, MN 55405

Schmidt, Garden & Erikson
104 S. Michigan
Chicago, IL 60603

Schneider Consulting Engineers
(Schneider, Inc.)
121 Seventh Street
Pittsburgh, PA 15222

Science Technology & Systems
P.O. Box 180
Plainsboro, NJ 08536

Sear-Brown Associates, P.C.
85 Metro Park
Rochester, NY 14623

Seatronics, Inc.
2601 W. Valley Hwy. North
Auburn, WA 98002

Segner & Dalton, P.C.
503 Grasslands Road
Valhalla, NY 10595

Seham Klein & Zelman
485 Madison Avenue
New York, NY 10022

Seidman & Seidman
700 Union Bank Plaza
Grand Rapids, MI 49503

Selco Controls, Inc.
10 Jacobs Road
W. Hartford, CT 06110

Self-Reliance, Inc.
1717 18th Street, N.W.
Washington, DC 20009

Servidyne Incorporated
P.O. Box 93846
Atlanta, GA 30377

Shambaugh & Son, Inc.
137 Chambeau Road
Fort Wayne, IN 46801

Shiffman & Tietjen Consulting Engineers
529 Central Avenue
Scarsdale, NY 10583

Shooshanian Engineering Associates, Inc.
129 Malden Street
Boston, MA 02118

Robert J. Sigel, Inc.
Sabine and Essex Avenue
Narberth, PA 19072

Jay M. Silverston and Associates, Inc.
235 Bear Hill Road
Waltham, MA 02154

J. E. Sirrine Company
P.O. Box 5456
216 South Pleasantburg Drive
Greenville, SC 29606

*B.G. Smith and Associates, Inc.
2009 Gallatin Street
Huntsville, AL 35801

Smith Hinchman & Grylls Associates
455 W. Fort Street
Detroit, MI 48226

Smith & Mahoney, P.C.
79 N. Pearl Street
Albany, NY 12207

Smith Seekman Reid Inc.
2135 Blakemore Avenue
Nashville, TN 37212

SNC, Inc.
P.O. Box 10
Desjardins Postal Station
Montreal, Quebec H3B 1C8
CANADA

Solar-Ray Architectural Corporation
Solar-Ray Systems, Inc.
P.O. Box 5277
Peoria, IL 61601

Solar-X of Texas
9444 Old Katy Road #116
Houston, TX 77055

South Coast Systems, Inc.
2110 E. First Street
Suite 109
Santa Ana, CA 92705

Southeast Energy Management
Corporation (SEMC0)
8829 San Jose Blvd.
Jacksonville, FL 32217

Southern Energy Consultants
(Precision Engineering Corporation)
P.O. Box 516
1217 Jackson Avenue
Oxford, MS 38655

Southern Engineering Company
of Georgia
1000 Crescent Avenue, N.E.
Atlanta, GA 30309

Southern Engineering Company
of Georgia
1800 Peachtree Street
Atlanta, GA 30367

Southland Energy Associates, Inc.
2651 Gondar Avenue
Long Beach, CA 90815

*South Orange Center
76 South Orange Avenue
South Orange, NJ 07079

Table B-1 (Continued)

Sowers, Rodas & Whitescarver
P.O. Box 4038
Roanoke, VA 24015

The SP Group
(Systems Planning Corporation)
2590 N. Alvernon Way
Tucson, AZ 85712

Walter F. Spiegel, Inc.
321 York Road
Jenkintown, PA 19046

Lawrence G. Spielvogel, Inc.
Wyncote House
Wyncote, PA 19095

The Spink Corporation
720 F Street
Sacramento, CA 95814

Spruce MTN Design
28 First Avenue
Montpelier, VT 05602

Stan & Associates
607 Third National Bldg.
Dayton, OH 45402

Standard Utilities Research
Engineers, Inc. (SURE)
250 E. 17th Street G.
P.O. Box 2062
Costa Mesa, CA 92627

Standeven, Yondt and Meyer, P.C.
Consulting Engineers
5550 Main Street
Buffalo, NY 14221

Stanley Consultants, Inc.
Stanley Bldg.
Muscataine, IA 52761

Robert E. Steinke & Associates
Route 1, Box 52
Artemas, PA 17211

Stone & Webster Management Consultants
(Stone & Webster, Inc.)
90 Broad Street
New York, NY 10004

Stottler, Stagg & Associates
Architects, Engineers, Planners, Inc.
8660 Astronaut Blvd.
Cape Canaveral, FL 32920

STV Engineers, Inc.
11 Robinson Street
Pottstown, PA 19464

Sullivan & Masson, Inc.
725 W. McDowell Road
Phoenix, AZ 85007

Sun Law Energy Corporation
14651 Ventura Blvd.
Sherman Oaks, CA 94013

Sunmaster Corporation
Design Division
35 West William Street
P.O. Box 1077
Corning, NY 14830

Sunspot Energy Management
Division of Dornbusch & Co., Inc.
1736 Stockton Street
San Francisco, CA 94133

Superior Energy Management
Division of Superior Supply Co., Inc.
215 Laura
Wichita, KS 67211

Sure Air Limited
291 Broadway
New York, NY 10007

Swanson Rink and Associates, Inc.
1640 Boulder Street
Denver, CO 80211

SYNCON
1717 S 12th Street
Milwaukee, WI 53204

The Synectics Group, Inc.
1130 17 Street, N.W.
Suite 400
Washington, DC 20036

Synergic Resources Corporation
Three Bala Plaza - 5th Floor
Bala Cynwyd, PA 19004

Synergistics
Division of Barth Electric Company
1835 North Meridian Street
Indianapolis, IN 46202

Syska & Hennessy, Inc.
11 West 42nd Street
New York, NY 10036

System Engineering Services
17480 East 17th Street
Suite 203
Tustin, CA 92680

Talbert, Cox & Associates, Inc.
6185 S. Buford Highway
Suite C-112
Atlanta, GA 30017

Talex Inc. Engineers
5407 N. IH 35
Suite 402
Austin, TX 78723

Taylor Systems Engineering, Inc.
P.O. Box 980
Fair Oaks, CA 95628

Team Concept, Inc.
4545 Centerview
Suite 100
San Antonio, TX 78228

*Teca, Inc.
476 Spotswood-Englishtown Road
Jamesburg, NJ 08831

Tec Energy Management Corporation
341 Frances Bldg.
Sioux City, IA 51101

Technical Development Corporation
11 Beacon Street
Boston, MA 02108

Technical Energy Analysis & Management
Systems (TEAMS), Inc.
Guarantee Electric
817 7 Avenue W.
Bradenton, FL 33505

T.E.M.P. (Total Energy Management
Planning) Associates
P.O. Box 12634
Jackson, MI 39211

Tennessee Energy Control, Inc.
260 W. Main Street
Hendersonville, TN 37075

TERA, Inc.
2849 Meadowview Road
Falls Church, VA 22049

Texas Energy Engineers, Inc.
3950 Braxton
Suite 200
Houston, TX 77063

Thall & Barhydt Associates, Inc.
3178 Bluett
Ann Arbor, MI 48105

Thermal Insulation Associates
2822 Boyer Avenue E. No. 6
Seattle, WA 98102

Thermaltech Consultants, Inc.
5721 Dragon Way
Cincinnati, OH 45227

Thermco Associates
Robert Brown Associates
500 E. Carson Plaza Drive
Suite 215
Carson, CA 90745

Thermo Electron Corporation
101 1st Avenue
P.O. Box 459
Waltham, MA 02254

Thermo Engineering, Inc.
172 Market Street
Elmwood Park, NJ 07407

Thermographics International
914 E. Queens Court
Suite B
Santa Maria, CA 93454

Mathew J. Thompson, III
Consulting Engineers, Inc.
9308 Warwick Blvd.
Newport News, VA 23601

Table B-1 (Continued)

3D/International
1900 W. Loop South
Houston, TX 77042

Thuro & Associates
1905 Warmlands Avenue
Vista, CA 92083

Time Energy Corporation
10635 Richmond
Houston, TX 77042

Total Energy Appl. Sys. Sales
192 Medford Avenue
Patchogue
Long Island, NY 11772

Total Energy Controls, Inc.
3240 University Avenue
Madison, WI 53705

*Total Energy Management Consultants Corp.
265 Franklin Street
Melrose, MA 02170

Total Energy Management Consultants (TEMCOM)
2350 Station Street
Indianapolis, IN 46218

Total Energy Management, Inc.
125 Valleyview, N.W.
Canton, OH 44708

Total Energy Services Inc.
7905 3rd Avenue
Brooklyn, NY 11209

Total Mechanical Systems
2101 Hammond Drive
Schaumburg, IL 60195

TPS Engineering Company, Inc.
(TPS Enterprises, Inc.)
1313 Lyndon Lane
Suite 104
Louisville, KY 40222

Trans Energy Engineering Corporation
Ferris & Hamig, Inc.
3303-A S. Kings Highway
St. Louis, MO 63139

Transflux International
2500 Lemoine Avenue
Fort Lee, NJ 07024

Tri-City, Inc.
1431 Callens Road
Ventura, CA 93003

Tri-City Mechanical & Refrig.
101 N. Union
Suite 107
Kennewick, WA 99336

Tri-Stem, Inc.
5101 Fort
Waco, TX 76710

United Engineers & Constructors
(Raytheon Company)
100 Summer Street
Boston, MA 02110

Utility Programs, Inc.
210 East 52nd Street
New York, NY 10022

Value Engineering, Inc.
10712 N. Stemmons
Dallas, TX 75220

R.G. Vanderveil Engineers, Inc.
38 Chauncy Street
Boston, MA 02111

Van Gulik & Associates, Inc.
543 Third Street
Lake Oswego, OR 97034

Charles R. Velsy Associates, Inc.
355 Main Street
Armonk, NY 10504

Vermont Energy Engr & Mgt., Inc.
24 Clarendon Avenue
Montpelier, VT 05602

Vineta, Inc.
3705 Sleepy Hollow Road
Falls Church, VA 22041

Vinokur-Pace Engineering Serv.
Access Computer Energy Analysis
135 Old York Road
Jenkintown, PA 19046

Viron Corporation
1828 Swift
Suite 300
N. Kansas City, MO 64116

Vitaclimate Control Systems, Inc.
Box 298 Main Street
Kingston, NH 03848

Vitro Engineering Corporation
(Automation Industries)
1835 Terminal Drive
Richland, WA 99352

Wagester Walker Thornton & Co.
312 Empire Bldg.
Pittsburgh, PA 15222

William E. Wallis Associates
Consulting Engineers, Inc.
8031 Broadway
San Antonio, TX 78209

Wardco Systems USA
RR #2, Box #7
Pipersville, PA 18947

Water Engineering Services
(Foyteck Ltd.)
5665 Chickadee Lane
Clarkston, MI 48016

Waterland, Viar & Associates, Inc.
One Pike Creek Center
Suite 204
Wilmington, DE 19808

Richard W. Watt & Associates, Inc.
P. O. Box 23183
Milwaukee, WI 53066

Leo S. Weil & Walter B. Moses, Inc.
600 Audubon Bldg.
New Orleans, LA 70112

Leo S. Weil & Walter B. Moses, Inc.
931 Canal Street
Suite 600
New Orleans, LA 70112

Werden Associates, Inc.
Box 414
Jenkintown, PA 19046

Wesdac, Inc.
21801 Stevens Creek Blvd.
Cupertino, CA 95014

Westac Services, Inc.
100 N. 20th Street
Suite 201
Philadelphia, PA 19103

Western Pacific International
880 So. Palm Avenue
Suite 11
Alhambra, CA 91803

Roy F. Weston, Inc.
Weston Way
West Chester, PA 19380

*Wex Corporation
1119 Charleston National Plaza
Charleston, WV 25301

Wiley and Associates
802 2nd Street
Coralsville, IA 52241

The Willeford Company
6650 Crescent Street
Suite 10
Ventura, CA 93003

H. A. Williams & Associates, Inc.
980 W. Henderson Road
Columbus, OH 43220

Wilson Associates, Inc.
1100 Jorie Blvd.
Oak Brook, IL 60521

*Wilson Electric Co.
113 South Madison Street
Rockford, IL 61104

Wolverton Engineering Company
847 40th Avenue, N. E.
Columbia Heights, MN 55421

Wood/Harbingers, Inc.
12707 120th Avenue, N. E.
Kirkland, WA 98033

Table B-1 (Continued)

Worldwide Energy Systems, Inc.
3300 Buckeye Road
Suite 648
Atlanta, GA 30341

Worldwide Marketing Systems, Inc.
7792-J Olentangy River Road
Worthington, OH 43085

Wulfinghoff Energy Services, Inc.
3936 Lantern Drive
Wheaton, MD 20902

Xenergy, Inc.
Executive Place V
60 Hall Road
Burlington, MA 01803

Yuen-Fenner, Inc.
28996 Hopkins Street
Hayward, CA 94545

Lev Zetlin Associates
131 State Street
Boston, MA 02109

Ziel-Blossom & Associates, Inc.
23 E. 7th Street
Cincinnati, OH 45202

Zien Mechanical Contractors
4858 N. 35th Street
Milwaukee, WI 53209

*Responded to advertisement in the Energy User News soliciting energy service companies interested in shared savings contracting with DoD.

Table B-1 (Continued)

APPENDIX C
CONTRACT CLAUSE REQUIREMENTS^{1,2}

- A. Type of Facility
- B. Location of Facility
- C. Client/Contractor split ratio of savings. Information provided in bid by contractor.
- D. Terms of Payment. Clause should almost always require prompt payment to contractor with stiff penalties for delayed payment.
- E. Effective Date of Contract. The date for beginning computation of contractor's fee from avoided costs, usually sometime after contract is signed and equipment installed.
- F. Designation of Meterable Portions of Facility. This clause is necessary if, for example, the contractor installs insulation or low-cost retrofits prior to a major installation project and desires initial payment for that portion only. After the major installation, the overall savings would then be billable. (The purpose of this is to protect the contractor by limiting his risk to only those items he has installed.) Other meterable portions might include space conditioning versus productivity related savings.
- G. Base Year Determination Clause must provide complete determination of the base year formula and provisions for restatement of the base year formula for predictor variables, as discussed in Chapter 4.

¹Brown, D. L., personal communication, Time Energy, Inc., September 1982.

²Klepper, M., et al., "Innovative Financing for Energy Efficiency Improvements," Phase I Report, Lane and Edson, Washington, DC, April 1982.

- H. Responsibility for Maintenance. This is a critical issue since DoD is expecting to obtain energy equipment maintenance from the shared savings contractor in addition to reduced energy consumption. In the private sector, the client's personnel usually do not provide adequate energy equipment maintenance even after training by the contractor. Contractors usually have sophisticated monitoring capability with installed EMCS equipment and can document equipment operating hours and any degraded level of maintenance by maintenance personnel. The "cleanest" contract for DoD would be to have the shared savings contractor perform all maintenance on energy consuming equipment and building envelope as part of his originally negotiated contract. If this is not the case, a clause is usually included stating that if, over several months, the level of preventive maintenance on equipment or facilities is not performed adequately by the client (e.g., less than 90 percent of required level), the contractor has the right to require the client to pay the contractor or other contractors to perform the required maintenance.
- I. Personnel authorized to negotiate and sign contract.
- J. Approval of both parties prior to selling or disposing of the building or facility. This clause will include penalties paid to the contractor if a facility is shut down or sold in the first year(s) of the contract, especially if high investment costs have been incurred.
- K. Contract Termination. This clause will set forth the conditions for termination by either party and will include liquidated damages as required. Buy-out conditions and payments are specified here.
- L. Right of Access. This clause defines right of access by contractor to equipment installed by contractor or incorporated into the contract work specifications. It also stipulates access to copies of the utility bills.

- M. Loss and Damage. This clause sets forth rights and responsibilities in the event of loss or damage to equipment, includes statement of insurance coverage including beneficiaries, and specifies persons authorized to remove equipment.
- N. Remedies for Breach of Contract by Either Party. This clause should include a requirement for binding arbitration.
- O. Savings Formula. This clause spells out how the savings will be determined, such as: current month base year consumption times current billing rate structure minus current monthly bill equals savings.
- P. Stipulations on various acceptable sources of capital financing. This clause will set out any Government-specific requirements that affect sources of capital available to the contractor through bank financing, limited partnerships, and brokerages.
- Q. Guaranteed Savings. This clause will address guarantees in energy (Btu) and utility dollar savings to be made part of the negotiated contract. This is important to DoD not only because of mandated requirements to reduce consumption (Btu/SF) 20 percent but also because this will allow objective determination of grounds for termination for nonperformance.
- R. Change Orders. This clause states very clearly what constitutes a change order (other than that is previously specified under changes to predictor variables in the baseline and energy accounting section) and spells out procedures for negotiating these costs. A description of how the DoD will finance such authorized change orders out of the DoD's share of the savings will also be specified. This is necessary in the original contract to reduce the risk to the contractor.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
	AD - A125273	
4. TITLE (and Subtitle) Shared Savings Contracting for Reducing Energy Costs of Defense Facilities		5. TYPE OF REPORT & PERIOD COVERED Final
		6. PERFORMING ORG. REPORT NUMBER ML207
7. AUTHOR(s) George M. Greider James M. Baker		8. CONTRACT OR GRANT NUMBER(s) MDA903-81-C-0166
9. PERFORMING ORGANIZATION NAME AND ADDRESS Logistics Management Institute 4701 Sangamore Road, P. O. Box 9489 Washington, D.C.		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS Assistant Secretary of Defense (Manpower, Reserve Affairs & Logistics)		12. REPORT DATE January 1983
		13. NUMBER OF PAGES 94
14. MONITORING AGENCY NAME & ADDRESS (If different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified
		15a. DECLASSIFICATION/DOWNGRADING SCHEDULE
16. DISTRIBUTION STATEMENT (of this Report)		
<div style="border: 1px solid black; padding: 5px; text-align: center;"> DISTRIBUTION STATEMENT A Approved for public release; Distribution Unlimited </div>		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
"A" Approved for public release; distribution unlimited.		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
Shared Saving Contracting, Energy Costs Reduction, Energy Conservation, Facilities Energy, Energy Management, Energy Services Companies		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		
<p>Study examines advantages and disadvantages of shared savings contracting for reducing defense facilities energy costs. The potential savings based on private sector experience is substantial; risks are small. Report presents guidelines for conducting pilot projects, a list of energy service suppliers, and contract clause requirements.</p>		

Environmental Energy Management
System
23845 Holman Highway
Monterey, CA 93940

Environmental Interfaces Inc.
2795 Randi Lane
Salem, OR 97303

A. Epstein and Sons Inc.
A. Epstein and Sons International
2011 West Pershing Road
Chicago, IL 60609

David R. Eshleman, P.E.
301 Pasture Lane
Raleigh, NC 27614

ESCCO
4412 S. 89th Street
Omaha, NE 68127

ESI, Inc.
4926 Adams Road
Hixson, TN 37343

E-Squared Engineering, Inc.
14610 Carmenita Road
Norwalk, CA 90650

ETA Engineering Inc.
415 E. Plaza Drive
Westmont, IL 60559

ETAP Inc.
(Energy Technology Applications)
1522 S. Beulah Street
Philadelphia, PA 19147

700 North Robert Street
St. Paul, MN 55103

Paul L. Geiringer and Associates
The Geiringer Organization
145 Main Street
Port Washington, NY 11050

General Energy Services
104 Lexington Avenue
Buffalo, NY 14222

*General Sound Telephone Company, Inc.
GST Energy Systems
1216 Washington Street
Allentown, PA 18102

General Systems Inc.
1360 W. 9 Street
Cleveland, OH 44113

Thomas J. Gerard & Assoc. Inc.
N. 1322 Post
Spokane, WA 99201

Gershman, Brickner & Bratton Inc.
1025 Vermont Avenue N.W.
Suite 608
Washington, DC 20005

Gibbs & Hill, Inc.
11 Penn Place
393 Seventh Avenue
New York, NY 10001

Gibbs Service Co. Inc.
350 Smokey Lane
P. O. Box 15776
N. Little Rock, AR 72231

*Godbeer, Godbeer & Associates
U.S. East Coast Office
New London, NH 03257

M. Goldberg-Energy Consultant
22 Colgate Lane
Woodbury, NY 11797

R. D. Goss Inc.
R519 Williams Street
Clearfield, PA 16830

John Graham and Co.
1110 3rd Avenue
Seattle, WA 98101

The Gratiot Engineering Company
39 Central Street
Box 453
Woodstock, VT 05091

Paul S. Gray Co. Inc.
Box 431
1301 Cannon Circle
Faribault, MN 55021

Great Lakes Controlled Energy Corp.
613 Pickwick Court
Mt. Prospect, IL 60056

Groover Engineering Co. Inc.
4258 Woodland Brook Drive
Atlanta, GA 30339

Grumman Energy Conservation Services
Grumman Aerospace Corporation
Mail Stop B30-30
Bethpage, NY 11714

END